U.S. EFFORTS TO COMBAT RADIOLOGICAL TERRORISM POST-9/11: INVITING THE NEXT CATASTROPHE

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ABSTRACT

This study assesses U.S. Government (USG) efforts to combat radiological terrorism post-9/11 in order to determine whether a disjuncture exists between the significance of the threat and the USG level of effort to address it, and if so, why this is the case. The objective is to help readers understand how the federal government can better protect the American people from a radiological attack.

The research builds upon unclassified risk assessments from the U.S. Intelligence Community and a foundation of literature from the academic and scientific communities that demonstrates a significant radiological risk to which the United States is highly vulnerable. The existing body of literature, however, generally focuses on the technical aspects of the threat (i.e., material availability, technical feasibility, and effects) rather than the overall level of effort on risk mitigation – and has not led to a policy consensus. No one has taken a systematic look to see if USG operational activities are effective at reducing risks and vulnerabilities. My study attempts to add value by filling this gap. I conducted an in-depth examination of federal radiological counterterrorism efforts post-9/11 in order to evaluate how well these efforts are addressing the threat and why they may be falling short.

The findings show that a disjuncture does in fact exist for a number of reasons. Current operational activities are not getting the job done, as intra- and interagency mission space conflicts and inadequate funding have caused major deficiencies across the areas of prevention and response. Rather than mandating an effective, concerted government effort to develop...
solutions, strategic-level disinterest due to a focus on the nuclear (versus the radiological) threat has added to the problem. Ultimately, the absence of both a presidential and congressional mandate and associated funds has left departments and agencies unable to overcome bureaucratic obstacles that stand in the way of truly effective radiological counterterrorism efforts.

The scope of this study is limited to U.S. efforts on the radiological threat. Additional research involving a direct comparison of all ongoing radiological counterterrorism efforts with nuclear (and even chemical and biological) counterterrorism efforts would be useful, as would an international comparison of U.S. priorities and activities with those of other countries.
The research and writing of this thesis is dedicated to those who work every day to protect the American people from the threat of a nuclear or radiological terrorist attack. I would like to thank Professor Jennifer Sims and my Georgetown University thesis seminar colleagues, especially Leah Kuchinsky, Alison Leary-Miller, and Christine Parthemore, for their excellent help along the way. I am also greatly indebted to the experts I interviewed, including those who remain anonymous, for so generously sharing their time and knowledge. Finally, I am sincerely grateful to my family and friends, and to RJC, for their constant support and love.

Many thanks,

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INTRODUCTION: THREAT VERSUS EFFORT

“Defending ourselves from the threat of radiological weapons has become a grim necessity,” declared Dr. Michael Levi and Dr. Henry Kelly of the Federation of American Scientists in 2002.¹ A few years later, Kelly repeated the warning and made an urgent appeal in Congressional testimony: “...the threat of malicious radiological attack in the U.S. is quite real, quite serious, and deserves a vigorous response.”² But by 2007, the Chairman of the Senate Homeland Security and Governmental Affairs Committee seemed to admit both failure and frustration: “The job is not finished and the threat is growing. Yet funding is being cut. The question is why?”³ The Department of Energy’s (DOE) National Nuclear Security Administration (NNSA), for example, may be spending as little as two percent of its nuclear nonproliferation budget on efforts dedicated to securing radiological sources that terrorists could use in an attack.⁴ Most significantly, no national-level strategy for radiological counterterrorism has been developed in the United States.

This study assesses U.S. Government (USG) efforts to combat radiological terrorism post-9/11 in order to determine whether a disjuncture exists between the significance of the threat and the USG level of effort to address it, and if so, why this is the case. If not, how well

is the USG doing? The objective is to help readers understand how the federal government can better protect the American people from a radiological attack.

**A Basic Technical Primer**

The “radiological threat” in the context of this study refers to terrorist use of a weapon that disperses radioactive materials, either in conjunction with conventional explosives (i.e., a “dirty bomb”) or through another means. It is distinct from the “nuclear threat” in that a radiological device does not require fissile materials (i.e., special nuclear materials) and thus does not produce a nuclear yield when detonated. This means that “a nuclear bomb creates an explosion that is millions of times more powerful than that of a dirty bomb.”

Terrorists using a radiological weapon, however, would likely be most interested in creating contamination and chaos – both of which they could accomplish if they chose the right radioactive isotope.

Certain materials are ideal for use in a radiological weapon because of physical and chemical properties that determine their radioactivity, dispersibility, and half-life (which in turn determines how long an isotope will remain highly radioactive). The existence of these materials in concentrated amounts, their portability, and the extent of their worldwide availability are key factors in determining their level of risk.

Based on these characteristics, isotopes of concern include Americium-241 (Am-241), Californium-252 (Cf-252), Cesium-137 (Cs-137), Cobalt-60 (Co-60), Iridium-192 (Ir-192), Plutonium-238 (Pu-238), Radium-226 (Ra-226), and Strontium-90 (Sr-90). Terrorists could detonate conventional explosives combined

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6 Ibid.
with radioactive materials in the form of a radiological dispersal device (RDD); passively
disperse materials by “spraying or spreading” them; or simply
place a radiation-emitting device
in a strategic location.  

**Problem Significance: Assessment of the Radiological Risk**

The threat of weapons of mass destruction (WMD) terrorism has become a major
concern of the U.S. national security community since the terrorist attacks on September 11,
2001, and policymakers must not underestimate the potential for terrorist use of a radiological
weapon. The U.S. Intelligence Community (IC) has consistently emphasized the threat from
chemical, biological, radiological, and nuclear (CBRN) terrorism in its annual assessments to
Congress, and in 2007 the Defense Intelligence Agency highlighted the feasibility of a
radiological attack, reporting that “…al-Qaeda and other terrorist groups have the capability and
intent to develop and employ a radiological dispersal device.”  

Just last month (in October 2010), the Chairwoman of the House of Representatives Subcommittee on Intelligence and
Terrorism Risk Assessment cited a combination of threats from radiological source insecurity
and homegrown terrorism in the United States as a “recipe for disaster.”

Code of Conduct divides these isotopes (along with several additional isotopes) into Category 1, 2, and 3
based on their danger to human health, with Category 1 isotopes posing the highest degree of
immediate danger. This Code has been used by countries (including the United States) in the
“development and harmonization of policies, laws and regulations on the safety and security of
radioactive sources.” IAEA, *Code of Conduct on the Safety and Security of Radioactive Sources*, Vienna:

9 Heather Pennington, “Counterterrorism and Law Enforcement Preparedness Conference: The RDD
Threat,” Albuquerque: Sandia National Laboratories (September 2010).
10 U.S. Intelligence Community Annual Threat Assessments to Congress, 2003-2010
Intelligence Agency, *Statement for the Record: Senate Armed Services Committee: Current and
This study builds upon these risk assessments and a foundation of literature from the academic and scientific communities that demonstrates a significant radiological risk to which the United States is highly vulnerable. The majority of experts agree that the relative probability and substantial consequences (particularly economic and psychological) of a radiological terrorist attack warrant an enhanced USG commitment in terms of both prevention and response.  

This assessment is based on key factors in the areas of material availability, technical feasibility, and effects.

Many experts argue that the likelihood of a radiological attack is greater than that of a nuclear attack, for example, because the requisite materials are abundant, accessible, and relatively easy to construct into a weapon. Assembly of an RDD does not require the more stringently controlled fissile materials necessary for a nuclear device, nor as high a level of technical competency. In fact, millions of radiological sources are used daily for medical, industrial, research, and commercial purposes at tens of thousands of civilian locations worldwide. Five thousand of these facilities house sources of at least 1,000 curies – about the

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12 There are also authors who do not view combating radiological terrorism as a priority compared to other, more important threats – but these authors still tend to agree with the key factors of material availability, feasibility, and consequences. For example: Committee on Science and Technology for Countering Terrorism, National Research Council, *Making the Nation Safer: The Role of Science and Technology in Countering Terrorism*, Washington: National Academy of Sciences, 2002.


size of a roll of quarters – which "represents a ‘significant quantity’ required to make a large radiological dirty bomb." Moreover, thousands of sources have been orphaned, or "lost, abandoned, stolen, or otherwise [fallen] outside of regulatory control."17

Radiological sources are prevalent inside the United States and not always adequately secured, precluding terrorists from having to overcome the multi-layered defenses in place both overseas and at U.S. borders. In his work Commercial Radioactive Sources: Surveying the Security Risks, Charles Ferguson presents a compelling case for enhanced source security by demonstrating the complexity of and vulnerabilities within the national (and international) regulatory systems that govern a commercial source throughout its lifecycle. The Government Accountability Office (GAO) exploited gaps in the areas of licensing, export control, and source disposal in a 2006 undercover investigation in which GAO employees illicitly purchased and transported radiological sources across U.S. borders. The growing threat of homegrown terrorism only enhances this danger, as Secretary of Homeland Security Janet Napolitano

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16 NNSA, Office of Global Threat Reduction Strategic Plan 2. The curie (Ci) is a unit of radioactivity: “The specific activity of a radionuclide is inversely proportional to its half-life, as curies per gram (Ci/g).” Argonne National Laboratory, "Radiological Dispersal Device (RDD)."


emphasized recently: “The threat picture we’re seeing shows an adversary that is evolving and adapting quickly, and that is as determined as ever to strike us here at home.”

In addition to its relative high probability, a radiological attack could have significant consequences. Radiological terrorism is often referred to as a weapon of mass *disruption* because it is unlikely to kill a large number of people or destroy an entire city. However, this type of attack could have a devastating, long-term economic and psychological impact on the affected geographic location and population. It could also cause immediate chaos and possibly deaths (from the explosive blast of an RDD) and could introduce a small chance of adverse human health effects in the form of radiation sickness and/or increased risk of cancer development over a lifetime. The resulting contamination could render an area uninhabitable for a prolonged period of time, closing businesses, displacing residents, and creating a permanent visual reminder of tragedy and insecurity. Joel Lubenau and Charles Ferguson underscored the potentially massive impact: “The costs of decontamination and, if necessary, rebuilding could soar into the billions of dollars, especially if an RDD attack occurred in a high-value urban setting. Moreover, terrorists detonating RDDs would try to sow panic by preying on people’s fears of radioactivity.” This combination of chaos, area of denial, financial cost, and psychological damage could be significant.

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22 An analysis of RDD terrorist attacks on the ports of Los Angeles and Long Beach showed that the “economic consequences from a shutdown of the harbors due to the contamination could result in significant losses in the tens of billions of dollars, including the decontamination costs and the indirect economic impacts due to the port shutdown.” H. Rosoff and D. von Winterfeldt, “A Risk and Economic Analysis of Dirty Bomb Attacks on the Ports of Los Angeles and Long Beach,” *Society for Risk Analysis* (2007) 533.
Although the dangers of radiological terrorism seem compelling, they have not led to a policy consensus on the importance of countering them. In addition, the body of existing literature generally focuses on analyzing the technical aspects of the radiological threat, not the overall level of effort on risk mitigation. No one has taken a systematic look to see if USG operational activities are effective at reducing risks and vulnerabilities. The remainder of my study attempts to add value by filling this gap. I conducted an in-depth examination of federal radiological counterterrorism efforts post-9/11 in order to evaluate how well these efforts are addressing the threat. Using the extensive evidence gathered through this analytical process, I then assessed apparent causes of ineffectiveness in prevention and response-related initiatives.  

There are several limitations of this study. First, the scope is restricted to examining USG efforts at the federal level, although federal government interactions with state and local officials are considered where relevant. Second, the evidence is limited to some extent by classification barriers, particularly with regard to specific threat-related information. Finally, it is important to note the inherently qualitative nature of the study in that assessing the impact of various causes was a subjective process involving my own judgment in weighing the evidence.

The main body of this paper is divided into two parts. Part One provides an analysis of USG operational efforts, assessing the effectiveness of these efforts and why they appear to be falling short in certain areas. Part Two then considers efforts at the strategic level, analyzing why the president and Congress have not focused on the radiological threat and how this disinterest may be contributing to operational problems. Finally, the paper concludes by

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24 See Appendix C, Research Note, for a detailed explanation of methodology. Ambassador Robert Gallucci, an expert on nuclear weapons policy and now President of the John D. and Catherine T. MacArthur Foundation, was instrumental in helping me develop the research plan. Interview with Ambassador Robert Gallucci on 27 August 2010.
addressing the implications of the findings for U.S. national security and proposing a plan of action to policymakers.

**PART ONE: OPERATIONAL FOCUS: PROGRESS SINCE 9/11, BUT CRITICAL GAPS REMAIN IN PREVENTION AND RESPONSE**

The evidence reveals a mixed record of progress and problems at the operational level in the areas of prevention and response. Individual departments and agencies have specific responsibilities related to combating radiological terrorism. These organizations clearly recognize the risk and have implemented a number of successful initiatives since 9/11. Despite this progress, however, several significant deficiencies remain in USG capabilities. In an interview, Bill Daitch, Department of Homeland Security (DHS) Domestic Nuclear Detection Office (DNDO) Assistant Director, stressed the importance of these findings: “You may have put your finger on a big flaw in U.S. Government policy – neglecting the RDD threat.”

**USG Missions and Efforts: The Good, the Bad, and the Ugly**

The good news is that major USG agencies responsible for the prevention mission have made great strides toward accomplishing the three critical prevention-related tasks with which they have been assigned: understanding the threat, securing radiological sources, and developing detection capabilities. These agencies include DOE/NNSA, DHS, the Department of Defense (DoD), the Department of State (DOS), the Nuclear Regulatory Commission (NRC), the Federal Bureau of Investigation (FBI), and the IC. With respect to characterizing the threat, the major players have commissioned the DOE national laboratories, the National Research Council, the Defense Science Board, and other independent organizations to conduct risk

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25 See Appendix B, Department and Agency Roles and Responsibilities, for an overview of each department/agency and its roles and responsibilities related to combating radiological terrorism.

26 Interview with Mr. William B. Daitch, Assistant Director, DHS/DNDO, on 7 October 2010. Mr. Daitch is a nuclear engineer, Captain in the U.S. Navy Reserve, and member of the Senior Executive Service.
assessments to better understand the radiological threat. In addition, the IC has briefed Congress annually on the significance of this threat.27

With respect to securing radiological sources, the U.S. national security posture is based on the principle of an active, layered defense as the best protection from external threats. In the realm of WMD proliferation, this includes locking down materials and weapons at their source, detecting the materials/weapons as far away from U.S. borders and as close to the source as possible, and when necessary, interdicting detected threats. The NRC, DOE/NNSA, and DHS have taken on the radiological source security mission with renewed vigor in recent years, both at home and abroad. Since the passage of the Energy Policy Act of 2005, the NRC has worked through the Radiation Source Protection and Security Task Force to identify gaps in domestic source regulation and to begin implementing solutions to improve security over the entire lifetime of a source.28 Most notably, the NRC has enhanced oversight of organizations and individuals with licenses to possess high-risk radiological sources, started developing a National Source Tracking System to keep tabs on sources throughout their life cycles, and initiated planning for security improvements to facilities nationwide that house radioactive material.29 In addition, DOE/NNSA has led a complementary effort “to reduce and protect vulnerable nuclear and radiological material located at civilian sites worldwide” through its Global Threat Reduction Initiative (GTRI).30 Through the GTRI, NNSA has helped secure over 800 sites in

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27 U.S. Intelligence Community Annual Threat Assessments to Congress, 2003-2010. More specific information on radiological threat-related intelligence collection, analysis, and communication to decision-makers was not accessible due to classification issues.
30 NNSA, Office of Global Threat Reduction Strategic Plan, i.
more than 40 countries, including 25,000 unwanted sources in the United States alone.\textsuperscript{31} These are sources that have already been orphaned or are no longer needed by the individual users to which they were licensed, and securing them is important in order to prevent them from falling into the wrong hands.\textsuperscript{32}

In terms of developing detection capabilities, DOE/NNSA and DoD, in coordination with DOS as the international lead, have installed radiation detection equipment at foreign land borders and ports and intercepted illicit materials at sea through major programs such as Second Line of Defense, Megaports, and the Proliferation Security Initiative (respectively).\textsuperscript{33} While the primary focus of these programs is to detect nuclear materials, they are also effective in identifying radiological sources. DHS has deployed detection portals to U.S. borders, ports, and cities and has assisted state and local law enforcement in acquiring radiation detection capabilities as a last line of defense inside the country. In addition, DHS/DNDO is melding all of these interagency efforts into a cohesive, coordinated whole-of-government operation called the Global Nuclear Detection Architecture – a “risk-informed, multilayered network to detect illicit radiological and nuclear materials or weapons.”\textsuperscript{34}


\textsuperscript{32} Unwanted radioactive sources include sources that are “excess, unwanted, abandoned, or orphan.” Excess or unwanted sources are those that are no longer needed by individual users to which they have been licensed. Off-Site Recovery Project (OSRP) website: <http://osrp.lanl.gov/> (accessed Oct 2010). Abandoned or orphan sources are those that have been “lost, abandoned, stolen, or otherwise [fallen] outside of regulatory control.” Center for Nonproliferation Studies at the Monterey Institute of International Studies for the Nuclear Threat Initiative, \textit{Radiological Terrorism Tutorial} and NRC, \textit{The 2010 Radiation Source Protection and Security Task Force Report}.

\textsuperscript{33} Interview with Mr. Ryan Connelly, Program Analyst, DHS/DNDO, on 12 October 2010. Mr. Connelly works on both domestic and international activities associated with the Global Nuclear Detection Architecture. DOE, \textit{FY2010 Congressional Budget Request} 352 and 384.

\textsuperscript{34} Warren M. Stern, \textit{Opening Statement Before the House Committee on Homeland Security}
The major players responsible for the response mission have made progress toward accomplishing three critical tasks: establishing national-level doctrine and plans for emergency response, developing operational capabilities to implement this response, and exercising these plans and capabilities to ensure their readiness. These departments and agencies include DHS, DOE, DoD, FBI, the Department of Health and Human Services (HHS), and the Environmental Protection Agency (EPA). With respect to the first task, DHS has, in its role as the federal lead for domestic incident management, published a series of overarching frameworks for integrated emergency response at the federal level and among state and local governments and the private sector.35 This national-level doctrine is intended to provide a broad, all-hazards approach to response, with the radiological threat addressed specifically in the Nuclear/Radiological Incident Annex to the National Response Framework, which outlines roles and responsibilities in the aftermath of an attack, and the National Preparedness Guidelines, which include an RDD-specific planning scenario for exercises.36 In addition, DHS’ Federal Emergency Management Agency (FEMA) chairs the Federal Radiological Preparedness Coordinating Committee, which brings the interagency community together to develop radiation preparedness policies and procedures.37

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With respect to the second task, developing operational capabilities to conduct emergency response, DHS has the lead for ensuring that state and local communities are prepared to execute the inherently local function of initial incident response. The Department has developed a Target Capabilities List to assist in the development of capabilities that are compatible with the National Incident Management System, and it has ultimately linked federal grant money to compliance with that system. In the event that state and local authorities request assistance, all of the responsible federal agencies have highly trained deployable teams to support various pieces of the consequence management effort. The FBI is well-prepared to collect and analyze evidence contaminated with radioactivity from the crime scene. In addition, the USG has a technical nuclear forensics capability which enables it to analyze interdicted nuclear or radioactive materials, or debris after the detonation of a nuclear or radiological weapon, to determine characteristics of the material that could shed light on its origin and ultimately support the attribution of an event.

With respect to the third task of testing these capabilities to guarantee their readiness, DHS is responsible for ensuring that “all levels of government across the Nation have the capability to work efficiently and effectively together” in the event that local authorities request assistance.


7. 38 HSPD-5, Management of Domestic Incidents.
41 Interview with Mr. Jeffrey Leggitt, Supervisory Special Agent, FBI, on 7 October 2010. Mr. Leggitt leads the FBI’s Hazardous Materials Response Team.
federal assistance. Toward this end, two relevant national-level exercises have taken place. These included the second Top Officials exercise (TOPOFF 2) in 2003, which involved response to an RDD in Seattle and a pneumonic plague outbreak in Chicago, and TOPOFF 4 in 2007, which involved RDD attacks in Portland, Phoenix, and Guam.

The bad news is that despite the accomplishments outlined above, there are several major deficiencies in both prevention and response. On prevention, leadership is weak and progress is slow on efforts to phase out the highest-risk radioactive materials and develop alternative technologies to replace them, and domestic source recovery and disposal does not appear to be as efficient as it could be. This last deficiency is especially troubling given that the source recovery problem is large in scope and not going away any time soon. An estimated 2,000 sources are registered unused or excess (i.e., no longer needed by individual licensees) each year in the United States alone, which does not include those orphan sources that are never registered at all. Earlier this year, the GAO reported, “Overall, our work has shown that despite investing billions of dollars in new technology to upgrade security procedures, gaps

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44 Interview with COL (P) Julie Bentz, Army National Guard, on 15 October 2010. COL Bentz is a senior Army National Guard officer and Ph.D. nuclear engineer who has extensive experience working nuclear and radiological issues at both the strategic and operational levels of the USG.
45 Radiological source recovery involves USG collection/removal of excess, unwanted, abandoned, or orphan sources, and disposal involves their ultimate disposition to radioactive waste repositories. OSRP website: <http://osrp.lanl.gov/> (accessed Oct 2010).
46 Unwanted radioactive sources include sources that are “excess, unwanted, abandoned, or orphan.” Excess or unwanted sources are those that are no longer needed by individual users to which they have been licensed. Ibid. Abandoned or orphan sources are those that have been “lost, abandoned, stolen, or otherwise [fallen] outside of regulatory control.” Center for Nonproliferation Studies at the Monterey Institute of International Studies for the Nuclear Threat Initiative, Radiological Terrorism Tutorial and NRC, The 2010 Radiation Source Protection and Security Task Force Report. Statistics from NNSA, Office of Global Threat Reduction Strategic Plan 8.
continue to exist in our nation’s ability to prevent terrorists from accessing or smuggling
dangerous quantities of radioactive material into the country.\footnote{47}

In addition, the complexities of emergency response and the potential for contamination
to force the closure and/or destruction of the affected area (which could be an important part of
a major city, like the National Mall or Times Square) require dedicated attention to developing
robust consequence management capabilities. Despite the progress toward planning for
response, expert assessments and exercise results indicate that the USG has not adequately
prepared local first responders or sufficiently demonstrated that all federal, state, and local
emergency response assets could actually accomplish their missions in the immediate aftermath
of a radiological attack. A U.S. Representative lamented during a 2007 hearing, “Despite the
threat of a domestic radiological attack in the U.S. cited by government officials since the 9/11
terrorist attacks, attempts to close the gap in U.S. radiological emergency response efforts have
only just begun.”\footnote{48}

In addition, the government has almost entirely ignored a critical task that comes at the
end of the emergency response phase: long-term recovery. This involves cleaning up the
contaminated incident site to allow for safe reentry and securely disposing of radioactive waste.
Decontamination, one key component of recovery, is of paramount importance: “The
contaminated areas can be unusable and uninhabitable for extended periods (years or decades in
the case of radiological weapons) unless effective decontamination technology and techniques

are available and applied.49 Employing the wrong decontamination methods can make debris more abundant and harder to clean up.50 Yet, decontamination of highly radioactive substances on tall vertical surfaces (i.e., buildings in a city) is a task that the USG does not know how to do well; in fact, that it has never done.51 Recovery operations are important overall because Americans who have been traumatically displaced during an attack will want to know when they can go home and that it is safe to do so – answers and assurances that the federal government could not confidently provide at this time.

Finally, the USG has not educated the American public well on the radiological threat, which will only enhance post-incident chaos. FEMA is primarily responsible for this mission, but efforts to date have been weak. In a 2007 hearing, a FEMA representative cited the RDD section on the DHS “ready.gov” website as evidence of progress in this area.52 However, FEMA has not made information on this site easily accessible – I had to search specifically for “RDD” in order to be re-directed to a fact sheet on radiological attacks.53

Dr. Kevin Carney, whose responsibilities at Idaho National Laboratory include radiological counterterrorism-related research, training, and exercise assistance, confirmed that overall, “The USG community at large is not prepared to handle a large-scale RDD event.”54

50 GAO, COMBATING NUCLEAR TERRORISM: Actions Needed to Better Prepare to Recover from Possible Attacks Using Radiological or Nuclear Materials.
51 Interview with anonymous DOE national laboratory scientist on 29 September 2010.
54 Interview with Dr. Kevin Carney, Nuclear Nonproliferation Division, Idaho National Laboratory, on 4 October 2010.
The “Ugly” Explained: Mission Conflicts and Insufficient Funds

Two major factors have impeded operational-level efforts: inter- and intra-agency mission space conflicts and insufficient resources. Conflicts over mission space have resulted in missed opportunities for cooperation and bureaucratic inefficiencies in the area of prevention. In the response realm, mission space conflicts have produced a more troubling problem: the failure to take responsibility for closing several critical gaps. One U.S. Senator expressed frustration during a 2007 hearing: “In a tight Federal budget with demands for homeland security funding that far exceed the capacity of this Nation to furnish it, it is discouraging to learn that coordination, both within DOE and with other key agencies, is lacking.”55

Mission Space Conflicts in Prevention

The detrimental effect of legacy mission issues and interagency coordination conflicts on USG prevention efforts is evident in the implementation of two key initiatives: alternative technology development and the recovery and disposal of unwanted or orphan radioactive sources.

First, the NRC has been reluctant to promote alternative technology development, despite strong recommendations from numerous radiation experts and independent bodies. This reluctance reflects the inherently difficult challenge the NRC faces balancing its regulatory responsibilities with its role as the Nation’s promoter of nuclear power and the safe and productive use of radioactive material.56 In a 2005 congressional testimony, expert Charles

Ferguson explained that the NRC “has taken the position that advocating alternative technologies is not part of its mission.”57 Two years later in another appearance before Congress, Ferguson again cited NRC resistance and underscored the need for greater USG cooperation with private industry source manufacturers to begin phasing out high-risk radioactive materials.58

A 2008 congressionally-mandated National Research Council study on the problem recommended that “a ban on new licenses for cesium chloride [the highly dispersible powder form of cesium-137] irradiators [is] the policy most worthy of immediate consideration by policy makers.”59 The NRC-led Radiation Source Protection and Security Task Force concluded in its 2010 report, however, that “an immediate phase-out…would not be feasible,” citing a number of challenges and pledging to further research a more gradual phase-out “as alternatives become technologically and economically viable and if disposal pathways are identified.”60 One co-author of the National Research Council report told me that a more concerted USG effort to promote alternative technologies for cesium chloride replacement would likely bear fruit and result in significant RDD risk reduction.61

Second, bureaucratic complexities may be hindering the recovery and disposal of “excess, unwanted, abandoned, or orphan” radiological sources through the Off-Site Recovery


61 It is worth noting that DOE/NNSA (NA-22) has recently begun funding some alternative technology research programs for cesium chloride replacement. Interview with anonymous DOE national laboratory scientist.
Project (OSRP), which is sponsored by DOE/NNSA’s GTRI and managed by Los Alamos National Laboratory in coordination with the NRC.\textsuperscript{62} The OSRP has made a great deal of progress, helping to secure approximately 23,500 radiological sources worldwide since 2003.\textsuperscript{63} The program is completely voluntary, however, depending upon individuals to proactively register\textsuperscript{64} a source they no longer want or need, or an abandoned source they have found, so that it can be considered for recovery by OSRP. The registration process requires time and effort on the part of individuals to fill out paperwork, wait for a response, further discuss “options and OSRP requirements for source documentation” with program officials, and finally work with those officials to facilitate the actual recovery of the source.\textsuperscript{65} In addition, the OSRP website states a disclaimer up front that the program may not be able to assist, which could discourage individuals from even bothering to register.\textsuperscript{66}

This process and its cumbersome requirements may be counterproductive, as it appears to be much easier for people to abandon a source (with no repercussions) than jump through all the hoops.\textsuperscript{67} Moreover, the sustainability of the source recovery effort is uncertain because there is currently no coordinated, long-term solution for end-of-life source disposal in the

\textsuperscript{62} The OSRP serves as the primary USG mechanism for the recovery of unwanted sources both within the United States and overseas. Radiological source recovery involves USG collection/removal of excess, unwanted, abandoned, or orphan sources, and disposal involves their ultimate disposition to radioactive waste repositories. ORSP website: <http://osrp.lanl.gov/> (accessed Oct 2010) and Interview with Mr. Ryan Connelly, Program Analyst, DHS/DNDO.

\textsuperscript{63} Ibid. OSRP website.

\textsuperscript{64} In order to register a source, an individual must contact OSRP either by phone or online and complete required paperwork documenting known information about the source in question (e.g., isotope, original activity, manufacturer, etc.). OSRP website, Source Registration Form: <http://osrp.lanl.gov/Documents/Source%20Registration%20Form%20%28Fillable-PDF%29.pdf> (accessed Oct 2010).

\textsuperscript{65} OSRP website, Sealed Source Registration page: <http://osrp.lanl.gov/PickUpSources.aspx> (accessed Oct 2010).

\textsuperscript{66} Ibid.

\textsuperscript{67} Interview with Mr. Ryan Connelly, Program Analyst, DHS/DNDO.
United States. Various states have formed “regional compacts” that allow them access to disposal facilities, but this system has led to the exclusion of some states and the absence of sufficient facilities that can accommodate all necessary types of radioactive waste. The 2010 Radiation Source Protection and Security Task Force Report identifies this issue as “by far the most significant challenge” confronting the radiological prevention community. The report recommends that DOE/NNSA and the USG continue working with states on developing source disposal solutions but stops short of identifying a specific responsible entity or path forward – except to say that ultimately, “the highest levels of government involvement, including congressional action” may be necessary.

Mission Space Conflicts in Response

The impact of mission conflicts and inadequate interagency coordination on USG response efforts is evident in the failure of the responsible departments and agencies to implement four key tasks: to adequately equip and train state and local first responders for radiological emergency response, to effectively coordinate the planning and execution of large-scale exercises, to build a capability to help the Nation recover from a radiological terrorist attack, and to ensure that the American public understands the threat and what the USG is doing about it. Deficient coordination has crippled efforts and left significant gaps in these important areas.

First, a federal emphasis on radiation detection for the prevention mission has resulted in inadequately equipped and trained local first responders. DHS/DNDO has led the federal effort to train and equip state and local officials to find radioactive material before it can be

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69 Ibid.
70 Sources are being placed in temporary secure storage, but ultimate disposal is the most secure long-term solution. Ibid. iii-iv.
71 Ibid. iv.
used in an attack, ensuring that preventive detection is included in the DHS Target Capabilities List – but detection as part of response to an incident is outside of DNDO’s mission. In fact, there has been no coordinated USG effort to equip local first responders with radiation detectors, resulting in inconsistent preparedness across the country.72 Some communities are well equipped because they have proactively sought out these tools through the homeland security grants process, but there is no federal requirement for them to do so.73 Moreover, even those communities that have the necessary equipment may not be trained to use it properly. Idaho National Laboratory’s Dr. Kevin Carney said that local first responders in Detroit, for example, were “clueless” during the 2007 RDD exercise Ardent Sentry, put on by DoD.74 This lack of equipment and training specific to radiological response means that depending on where an attack occurs, first responders may not be able to detect radiation upon arrival at the incident site.

Second, inadequate coordination on exercises has left a large amount of uncertainty as to whether state, local, and federal operational responsibilities could be executed effectively after a real-world radiological attack. TOPOFF 4 revealed a number of major problems with both the planning process and player capabilities. Exercise planners were unable to garner the full participation of the range of key players because of a lack of high-level commitment from federal officials and a failure to engage state, local, and private sector leaders early on and with clear guidance.75 In this and other national-level exercises, so many different organizations came to the table with objectives specific to their individual missions that they ended up exercising almost in parallel rather than together. In the 2007 Ardent Sentry exercise, for

72 Interview with Mr. Ryan Connelly, Program Analyst, DHS/DNDO.
73 Ibid.
74 Interview with Dr. Kevin Carney, Nuclear Nonproliferation Division, Idaho National Laboratory.
example, 5,000 players participated with 2,000 exercise objectives.\textsuperscript{76} It has been especially challenging to integrate local consequence management teams and federal law enforcement personnel, each of whom has a very different set of goals and interests post-blast.\textsuperscript{77}

Bureaucratic inefficiencies also appear to have caused the failure of the most important function of the exercise process – to facilitate improvements based on lessons learned. It took DHS officials over a year-and-a-half to issue a comprehensive TOPOFF 4 After Action Report for use by all of the federal, state, and local players who participated.\textsuperscript{78} Moreover, specific deficiencies in areas such as interoperable communications, radiation dispersion modeling (to help responders protect themselves and local citizens), and public outreach seem to be issues that are always “lessons” but never actually “learned.”\textsuperscript{79}

Third, agencies have failed to take responsibility for and work together on developing a national recovery capability. Independent reports and expert interviews across the board cited the area of recovery as a major critical gap in USG preparation for a radiological attack. Not only is there currently no national-level disaster recovery plan, individual agencies have been playing hot potato with cleanup responsibilities for several years.\textsuperscript{80}


\textsuperscript{77} Interview with Dr. Kevin Carney, Nuclear Nonproliferation Division, Idaho National Laboratory.

\textsuperscript{78} DHS OIG, \textit{Efforts To Address Lessons Learned in the Aftermath of Top Officials Exercises}.

\textsuperscript{79} GAO, \textit{FIRST RESPONDERS: Much Work Remains to Improve Communications Interoperability}, Washington: GAO, 2007; GAO, \textit{HOMELAND SECURITY: First Responders’ Ability to Detect and Model Hazardous Releases in Urban Areas is Significantly Limited}, Washington: GAO, 2008; and Interview with Mr. Ryan Connelly, Program Analyst, DHS/DNDO.

\textsuperscript{80} GAO, \textit{COMBATING NUCLEAR TERRORISM: Actions Needed to Better Prepare to Recover from Possible Attacks Using Radiological or Nuclear Materials}” and Interview with Mr. William Ulicny, Program Manager, DHS/DNDO, on 7 October 2010. Mr. Ulicny is a health physicist who previously supported the DoD Defense Advanced Research Projects Agency. Also discussed recovery issues during interviews with Daitch, Connelly, Bentz, Carney, and anonymous DOE national laboratory scientist.
Multiple agencies have avoided implementing a key piece of their missions in failing to establish an official federal standard for “how clean is clean,” or the points at which people must be relocated and allowed to return after an event. According to one DOE national laboratory expert, the EPA and NRC are concerned that setting a standard will create controversy with people arguing that it is either too stringent or not stringent enough – so they have simply set no standard at all.81 Another element of confusion came into play in recent years when FEMA guidance directed local communities to make this determination following an attack on a case-by-case basis.82 This mission avoidance and lack of coordination has left the response community with suggested guidelines instead of codified and consistent standards.

Even if there was an agreed-upon federal cleanup standard, interagency mission conflicts have resulted in a USG inability to conduct radiological decontamination in urban environments. Research and development on decontamination technology has fallen through the cracks: the mission went from the Defense Advanced Research Projects Agency at DoD to the EPA to DHS Science and Technology (DHS S&T) all in the early to mid-2000s, and in 2005 an even larger gap formed when DHS S&T transferred all of its radiological and nuclear functions to the new DNDO – which had a primarily preventative mission that did not include

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81 Interview with anonymous DOE national laboratory scientist.
82 DHS/FEMA 2008 Planning Guidance supplements 1992 EPA Protective Action Guidance, but it still does not set required standards. This is problematic for a number of reasons. If there is a significant amount of highly radioactive material dispersed in the attack, federal assets will almost certainly be called to assist with recovery operations, and these assets will need an established standard ahead of time in order to adequately prepare. In addition, different communities will inevitably opt for different cleanup thresholds based on different scientific standards, leaving some cities “dirtier” than others after an attack and citizens unsure of their personal health and safety. Hashing out cleanup standards after an event also takes time that local communities do not have, as contamination sets into buildings and the environment and becomes even more difficult to remove. DHS/FEMA, “Planning Guidance for Protection and Recovery Following Radiological Dispersal Device (RDD) and Improvised Nuclear Device (IND) Incidents,” Federal Register (2008); DHS, The National Response Framework; and Interviews with Mr. William Ulicny, DHS/DNDO and anonymous DOE national laboratory scientist.
response and recovery. FEMA and the EPA share some recovery responsibilities today, but no agency is dedicating the attention or funding required to build the functioning, robust cleanup capability that is needed.

In addition, no mechanism or repository currently exists to accommodate potentially large amounts of leftover radioactive rubble, due to conflicts of authority and jurisdiction among multiple levels of government and a reluctance to build such an expensive capability that may never be used. As noted by former EPA Associate Administrator Thomas Dunne, “…that is a significant gap if we ever do have a [radiological] attack.”

A recent GAO survey underscored the importance of the gap in recovery capabilities in finding that state and local emergency management officials expected to “rely heavily on the federal government to conduct and fund analysis and environmental cleanup activities” but were concerned about the federal capability to provide support. A coherent federal recovery capability has not been developed; thus, it has not been exercised or coordinated with state and local communities either. In fact, only three of 90 nuclear/radiological exercises in the past six years have included a recovery element. This has caused confusion among state and local officials regarding who in the federal government they should turn to for help.

The fourth and final response deficiency involves a lack of communication between the federal government and the American people. The USG has not done a good job of educating the public on the radiological terrorism risk. Experts I interviewed from DHS, DoD, and the

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83 Interview with anonymous DOE national laboratory scientist.
85 Ibid.
86 GAO, COMBATING NUCLEAR TERRORISM: Actions Needed to Better Prepare to Recover from Possible Attacks Using Radiological or Nuclear Materials.
87 Ibid.
88 Ibid.
FBI all emphasized that inadequate communication from the federal government to individual citizens has resulted in poor public understanding and awareness regarding radiological terrorism.\(^8\) Lessons learned from TOPOFF 4 cited inadequate public outreach as a major deficiency, including a lack of engagement of local citizens leading up to the exercise and confusing messaging in the immediate aftermath of the simulated detonation (e.g., waffling on critical instructions to evacuate versus shelter-in-place).\(^9\) The 2010 Radiation Source Protection and Security Task Force Report lists the development of a “plan of action” for a “comprehensive public education campaign” related to radiological threats as its first major accomplishment since 2006, but goes on to say that all public outreach efforts have since been transferred to FEMA.\(^1\) Progress beyond plans remains to be seen.

Overall, the disconnect between the significance of the threat and the level of effort to counter it at the operational level appears to be more severe in terms of response capabilities than prevention efforts. This disparity is not surprising when one considers the complexity of response and a USG tendency to downplay the consequences of a radiological attack. There are many more factors to consider on the response side – such as interagency/intergovernmental coordination, roles and responsibilities, time pressures, and operational phases (i.e., immediate emergency response actions as well as longer-term cleanup and recovery requirements) – than on the prevention side.\(^2\) Moreover, the greater disconnect on the response side makes sense given an apparent bias of USG leadership against the impact of a radiological attack. The prevailing sentiment seems to be that the consequences would be manageable – so why waste a

\(^8\) Interviews with Leggitt, Daitch, and Connelly.
\(^9\) DHS OIG, Efforts To Address Lessons Learned in the Aftermath of Top Officials Exercises and Interview with Mr. Ryan Connelly, DHS/DNDO.
\(^1\) NRC, The 2010 Radiation Source Protection and Security Task Force Report i.
\(^2\) Interview with Mr. Ryan Connelly, DHS/DNDO.
lot of time and money on response efforts?93 If USG officials are not interested in response, they will certainly not be keen on investing in a long-term recovery capability – an even more expensive endeavor that may never be used.

Ultimately, the efforts of USG departments and agencies have fallen short in both the areas of prevention and response. Mission space conflicts and sub-par cooperation have inhibited agencies from effectively implementing a number of critical initiatives designed to thwart a radiological attack or mitigate its consequences. This situation “may be a recipe for creating the ingredients for a radiological Katrina if the U.S. government is forced to respond to a real-world radiological emergency today.”94 Sorely lacking resources across the board only exacerbate these problems.

**Inadequate Funding for Prevention and Response**

In addition to the mission space issues outlined above, the USG has failed to get the most bang for its buck on radiological counterterrorism because it has not embraced the low-cost, high-payoff nature of the game. USG failure to dedicate adequate – but still minimal compared to nuclear – resources to combating the radiological threat has slowed progress on both prevention and response and left the United States more vulnerable to a costly attack.

Current funding lines are too small to move good initiatives forward quickly and not big enough to overcome the operational deficiencies described in the previous section. The combined nature of CBRN counterterrorism programs and budgets precluded me from pinpointing the total amount of funding dedicated to radiological efforts alone; however, multiple USG and DOE national laboratory experts agreed in interviews that the proportion of

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spending on nuclear versus radiological-focused counterterrorism efforts is approximately 90 to 10 percent. All agreed that the severity of the nuclear threat warranted a greater share of the overall pot but that efforts should also be enhanced in one or more areas specific to the radiological threat. Charles Ferguson noted to Congress during a 2005 hearing that “…a wise, but still limited, investment of government resources can do much to reduce the likelihood and consequences of dirty bomb attacks.”

Minimal increases in funding may buy the USG large improvements in radiological security – but the government does not seem to fully understand this opportunity to increase its return on investment. A 2005 Defense Science Board study found that the USG was concentrating its resources on a handful of very expensive programs rather than spreading the wealth ever so slightly to cover neglected but important areas such as “prevention of radiological attacks (through securing sources)…and recovery.” The majority of existing programs are exclusively nuclear-focused, with huge (and growing) budgets. For example, the long-standing Nunn-Lugar Cooperative Threat Reduction (CTR) Program, which focuses on nuclear weapon elimination in the Former Soviet Union, expects a $100 million plus-up in Fiscal Year 2011 to $522 million to help advance Administration nuclear security priorities.

Even programs that address both the nuclear and radiological threats seem to be heavily weighted toward the nuclear side.

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95 Interviews with Carney, Daitch, Ulicny, Connelly, and anonymous DOE national laboratory scientist. One expert thought that radiological funding was actually higher: Interview with Mr. David Chamberlain, Chemical Engineer and Department Manager, National Security, Argonne National Laboratory, on 4 October 2010.


In addition, only $561 million out of a $2.1 billion total DOE/NNSA nuclear nonproliferation budget in Fiscal Year 2010 went to programs that support radiological in addition to nuclear threat prevention efforts.\(^99\) Of this $561 million, $207 million went to Nonproliferation and International Security initiatives – the focus of which is on nuclear safeguards – and $353 million went to the GTRI, which is one of the few programs that includes tailored radiological source security and recovery efforts both at home and abroad.\(^100\) Further, one DOE national laboratory expert who works on the program estimated that GTRI resources are split approximately 90 to 10 percent nuclear to radiological.\(^101\) This means that NNSA is only spending in the ballpark of $35 million, or less than two percent of its total budget, on radiological source security – while the remaining $2 billion goes toward nuclear security.

Findings from a 2007 GAO study correctly predicted this type of disparity, reporting that “DOE’s budget for radioactive source security has been reduced, and future program funding is uncertain” due to shifting priorities and a lack of high-level commitment:

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\text{…future funding will be redirected to, among other things, securing special nuclear material, such as plutonium and highly enriched uranium (HEU)…In contrast, other GTRI elements, including the [international radiological source security] program, do not have presidential commitment dates for completion and, as a result, are lower priorities for funding.}\] \(^102\)

A comparison of these nuclear numbers to the funding necessary to beef up radiological counterterrorism efforts lends credence to the argument U.S. Representative Jane Harman emphasized in October 2010 – that the radiological material security problem is “something we

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\(^99\) DOE, FY2010 Congressional Budget Request: National Nuclear Security Administration 351.

\(^100\) Ibid.

\(^101\) Interview with anonymous DOE national laboratory scientist.

\(^102\) GAO, NUCLEAR NONPROLIFERATION: DOE’s International Radiological Threat Reduction Program Needs to Focus Future Efforts on Securing the Highest Priority Radiological Sources 41.
can actually do something about...and for relatively little money." For example, a $125 million one-time expenditure could secure radioactive material in the 500 major hospitals throughout the United States. Former USG expert and current nonproliferation analyst Ken Luongo added, “You will literally be leveraging a little over $100 million against hundreds of millions, if not billions, of dollars in economic disruption... That to me is a no-brainer.”

In fact, small, targeted plus-ups would likely make a big difference in improving USG capabilities, including addressing several of the critical deficiencies discussed in the previous section. Increased resources for prevention could target specific problem areas, such as unwanted/orphan source recovery and disposal, in addition to accelerating the broader, ongoing source security efforts of the NRC and DOE/NNSA. In addition, even small budget line items for specific agencies to work on the recovery mission could help clarify responsibilities and begin filling a truly gaping hole in the USG response capability.

In sum, a little more money could go a long way. So could a little push from the top.

**PART TWO: STRATEGIC NEGLECT: A DISCONNECT AT THE HIGHEST LEVELS**

Part Two of this paper reveals a disjuncture between the significance of the radiological threat and strategic-level efforts to counter it. This lack of strategic focus is important because it has contributed to the problems at the operational level. White House and congressional

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104 Ibid.
attention is critical for providing a much-needed mandate to departments and agencies to take full responsibility for their missions, overcome bureaucratic obstacles, and close critical gaps. However, little dedicated action has been taken toward combating radiological terrorism at the strategic level – primarily due to a focus on the nuclear (versus the radiological) threat; that is, the detonation of a weapon containing the fissile materials that would produce a nuclear explosion.

**Evidence of Neglect: Presidential Brush-Aside and Congressional Posturing**

Presidential administrations since 9/11 have shown little interest in radiological strategy or policy, and congressional efforts have been all talk and little action. Despite threat assessments and critical inquiries over the past eight years, White House inclusion of the radiological threat in WMD-related national policy and strategy has been both minimal and inconsistent. Thus, the country lacks a tailored radiological counterterrorism plan that effectively incorporates all responsible departments and agencies across the entire mission space, from prevention through recovery.

Within the combating WMD sections of key national security documents, the focus is almost exclusively on the other types of threats within the spectrum, namely chemical, biological, and nuclear – with the greatest emphasis typically on nuclear. The first post-9/11 strategic document on WMD proliferation and terrorism, *The National Strategy for Combating WMD* (2002), set the precedent by defining WMD as “nuclear, biological, and chemical.”

Subsequent strategies have addressed the radiological threat only in passing or not at all, sometimes citing it as part of the CBRN spectrum, sometimes including it as a subset of the nuclear threat, but never dedicating more than a word or two at a time. In all these high-level

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policy documents, the radiological threat merits but does not receive its own paragraph or separate section the way that the other threats apparently do.\textsuperscript{108} In addition, the radiological threat has been absent from White House-level rhetoric on WMD terrorism.\textsuperscript{109}

The Obama Administration has launched an aggressive fissile materials/weapons-related security agenda, as outlined in the President’s April 2009 Prague speech and codified in the 2010 Nuclear Posture Review Report, centered around several key arms control and nonproliferation initiatives.\textsuperscript{110} On the state actor side, these have included negotiating a new Strategic Arms Control Reduction Treaty with Russia, pursuing U.S. ratification of the Comprehensive Test Ban Treaty, strengthening the Nuclear Nonproliferation Treaty, pursuing a treaty to verifiably ban state production of fissile material, developing a new international framework for civil nuclear cooperation, and working with the international community against the proliferation threats from Iran and North Korea.\textsuperscript{111} In addition, the President declared terrorist acquisition of a nuclear weapon to be “the most immediate and extreme threat to global

\textsuperscript{110} Ibid. President Obama.
security” and set forth the goal of securing all vulnerable nuclear material worldwide within four years.112

The April 2010 Global Nuclear Security Summit mobilized the world toward achieving this goal, garnering an unprecedented level of international attention, consensus, and commitment.113 Not only did the leaders of 47 nations attend the event, all of them worked together to draft and endorse a final Communiqué and supporting Work Plan, which outline specific actions countries will take to combat nuclear terrorism.114 This unprecedented international event was no doubt a major step forward in addressing a very important global threat. Reporting following the event, however, confirmed that some participants would have liked to see a broader agenda, as they “believe their money should be spent on what they consider more likely dangers, such as that of a low-grade radiological weapon, or ‘dirty bomb.'”115 The omission of the radiological threat was a missed opportunity that reflects the emphasis of the current Administration on threats related to nuclear (fissionable) devices.

Congress, meanwhile, has been fairly active in highlighting the radiological threat through numerous hearings since 9/11 but has rarely turned this interest into focused legislation or dedicated resources. Members of both the House and Senate have sharply criticized federal radiological counterterrorism efforts over the past eight years, turning to key government and independent witnesses to expose serious deficiencies – but Congress has not translated that
criticism into real change. In fact, although a radiological section or subset has been included in several broader WMD-related laws, no legislation has been passed since 9/11 that is dedicated primarily to combating the radiological terrorism threat.\textsuperscript{116} Hence, a disconnect exists between the congressional rhetoric on radiological terrorism and congressional action. Evidence exists that when Congress does take action, good things happen: for example, inclusion of one provision on radiological source security in the \textit{Energy Policy Act of 2005} successfully mandated the NRC to take make substantive long-term improvements.\textsuperscript{117} Congress has not, however, used this legislative power to its full potential. More often than not, members who have introduced radiological security-related bills have failed to garner the broader support necessary to pass those bills into law.

\textbf{Neglect Explained: Nukes, Nukes, Nukes}

The primary cause of disjuncture between threat and response at the strategic level is a USG decision to concentrate efforts and resources on the threat of nuclear terrorism. As Ken Luongo put it, “People are focused on the big bang. They’re not focused on what it means to have radiation dispersed all around an urban area.”\textsuperscript{118} This nuclear materials/weapons focus is most obvious at the White House level, where the radiological threat has barely been acknowledged in high-level policy, strategy, and rhetoric. Three major factors have contributed


\textsuperscript{117} Legislative requirements in the \textit{Energy Policy Act of 2005} mandated the NRC to establish a Task Force to evaluate security of radiological sources within the United States and deliver a report with recommendations to Congress within one year on the following: 1) additional sources to be secured, based on a number of risk factors, 2) development of a national source recovery system, 3) development of a secure storage system, 3) improvements to the national source tracking system, 4) development of a source disposal system, 5) enhanced export controls, 6) development of alternative technologies, and 7) procedures for improving the security of source use, transportation, and storage. NRC was required to take action on the recommendations no later than 60 days after delivery of the report. 109\textsuperscript{th} Congress, \textit{Energy Policy Act of 2005 (Public Law 109-58)}, 8 August 2005 <http://thomas.loc.gov/cgi-bin/bdquery/z?d109:h.r.00006> (accessed Sep 2010).

\textsuperscript{118} Martin Matishak, “Senior Lawmaker Says U.S. Unprepared for ‘Dirty Bomb’ Attack.”
to this imbalance: a prioritization of the significance of physical consequences, a cognitive bias toward the more familiar nuclear weapons threat, and an assumption that nuclear counterterrorism efforts encompass the radiological threat to the extent that separate, dedicated initiatives are not necessary.

Consequences: The Big Bang

First, the USG focus on nuclear over radiological terrorism is due to an emphasis on the much more destructive physical consequences of a nuclear detonation (in terms of human casualties and infrastructure damage) over the economic, psychological, and lesser physical consequences of a radiological attack involving conventional yield with dispersal of radioactive materials. There appears to be a tendency to value the importance of high consequence over high probability risks. Consequences are quantitatively weighted more heavily in some agencies’ risk assessment calculations, such as DHS’ Risk = f (threat, vulnerability, consequences), even though “this is not an acceptable way for dealing with uncertainty.”

Experts I interviewed from multiple federal departments emphasized consequences as a major driver of the USG nuclear focus. Some experts believe that the United States has the capacity to easily absorb the consequences of a radiological attack, which would be much less severe than a nuclear detonation in terms of physical consequences. FBI Supervisory Special Agent Jeff Leggitt summarized: “It’s a mindset thing.”

The emphasis on massively destructive consequences has been a consistent theme throughout U.S. national security doctrine in the post-9/11 era. The first National Strategy for Combating Weapons of Mass Destruction in 2002 set the precedent for the U.S. focus on

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120 Interviews with Daitch, Leggitt, Bentz, Ulicny, and Connelly.
121 Interview with COL (P) Julie Bentz, Army National Guard.
122 Interview with Mr. Jeffrey Leggitt, Supervisory Special Agent, FBI.
nuclear, chemical, and biological weapons capable of “killing large numbers of our people.”\textsuperscript{123} The strategic documents that have followed, including the most recent\textit{National Strategy for Homeland Security} (2007) and the inaugural\textit{Quadrennial Homeland Security Review} (2010), consistently highlight the “catastrophic,” “high-consequence” effects of these weapons.\textsuperscript{124} In Prague, President Obama stressed, “One nuclear weapon exploded in one city…could kill hundreds of thousands of people. And no matter where it happens, there is no end to what the consequences might be…”\textsuperscript{125} Since the Obama Administration took office, it has produced a\textit{National Strategy for Countering Biological Threats} (2009) (which also emphasizes “unmitigated consequences” for the lives of “hundreds of thousands of people”) and a new\textit{National Security Strategy} – which does not even mention the radiological threat in the context of WMD terrorism.\textsuperscript{126}

It thus appears that high-level USG officials may be underestimating the consequences of a radiological attack, despite the warnings outlined at the outset of this paper from academic scholars, scientific experts, and government agencies on the devastating economic costs, psychological effects, and general chaos that such an attack could produce.\textsuperscript{127} Some high-level department planning tends to downplay these consequences. A 2007 Defense Science Board study found, for instance, that the development process for the DHS National Planning Scenarios (which underpin the entire National Exercise Program) tended to underestimate

\textsuperscript{123} The White House, \textit{NSPD-17 / HSPD 4 [unclassified version]}.


\textsuperscript{125} President Obama, “REMARKS BY PRESIDENT BARACK OBAMA: Hradcany Square, Prague, Czech Republic.”


\textsuperscript{127} Expert estimations of consequences are outlined in the Introduction of this paper.
consequences in general but particularly in terms of economic costs, one of the most important effects of a radiological weapon.\textsuperscript{128} One DHS interviewee cited a perception that a radiological attack would be an easily mitigated local event, underscoring a USG tendency not to consider potential national and international implications because an attack has never happened.\textsuperscript{129} Past security incidents, however, demonstrate how a seemingly isolated, small-scale event can have a very large scope.

In 1987, for example, local citizens in Goiania, Brazil opened a canister of cesium-137 and inadvertently spread the radioactive powder around the town. The resulting contamination caused “four deaths, thousands of people being monitored, and economic losses adding up to hundreds of millions of dollars.”\textsuperscript{130} This innocent accident had a major impact.

A more recent example, this time involving the small-scale use of radioactive materials for nefarious purposes, was the 2006 murder of former Russian Federal Security Service officer Alexander Litvinenko. Litvinenko died from acute radiation syndrome after being poisoned with the radioactive isotope polonium-210. This isolated radiological attack, which targeted just one individual, created an international incident involving investigative bodies from the United Kingdom, Russia, the United States, Germany, and Interpol.\textsuperscript{131} The travels of Litvinenko and the suspected perpetrators throughout London and between Russia and London left a contamination trail affecting “dozens of locations,” “hundreds of people,” and three aircraft that were grounded upon discovery of small traces of radiation after having made

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multiple international flights. British health officials had to “develop an entirely new testing regime to examine everyone who had come into contact with [Litvinenko]” and work with the Foreign Office to contact the home governments of “people from 52 countries who could have been contaminated with polonium.” Describing the chaos that ensued in the immediate aftermath of Litvinenko’s death, the Chief of the United Kingdom’s Health Protection Agency said, “Every emergency has a shape – usually it starts with a big bang, levels out and then tails off…but this one went up and up and up and up.”

Fortunately, there were no other serious illnesses or deaths related to the Litvinenko murder – but the incident offers a sobering example of how a seemingly small-scale attack can have international implications that expend the resources of multiple governments and scare large numbers of people. Also, one must consider that terrorists aiming to use a radiological weapon to create a major disruption (as opposed to the objective in the Litvinenko case to harm just one individual) would tailor the attack to maximize its consequences. For example, polonium-210 was an excellent choice for a targeted poisoning because it is only deadly when ingested. It did not produce a severe or long-lasting contamination problem because its relatively short half-life enabled a quick cleanup. In addition, because the intention was to affect Litvinenko alone, the perpetrators left only small traces of contamination in their trail; that is, it was not their aim to spread the radiation. Terrorists carrying out a radiological attack,

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133 Ibid. Boggan.
134 Ibid.
135 Polonium-210 is an alpha-emitter that causes an internal radiation hazard but is not harmful outside the body (i.e., cannot penetrate the human skin). A short half-life (140 days for polonium-210) means that a radionuclide decays fairly quickly, decreasing the strength of its radioactivity. Argonne National Laboratory, “Radiological Dispersal Device (RDD).”
on the other hand, could choose an isotope like cesium-137, which is an easily dispersible material that can penetrate the skin to make people sick and whose much longer half-life could contaminate and close down the affected area for decades.\textsuperscript{136} In addition, if these terrorists detonated an RDD, they could achieve the added physical destruction, possible injuries and fatalities, and chaos from the explosion. The possibility of follow-on hoaxes or actual attacks would of course only increase the magnitude of potential consequences.\textsuperscript{137}

Thus, the Litvinenko case provides a good example of the large-scale effects of a small-scale radiation incident – but the aftermath of a radiological terrorist attack could be much worse. Charles Ferguson underscored the implications: “The glaring but largely overlooked message in the radiation poisoning of former Russian spy Alexander Litvinenko is that the underworld has become expert in effectively using radioactive materials for malicious purposes.”\textsuperscript{138}

\textit{Cognitive Bias: Historical Precedence}

A second factor contributing to the nuclear materials/weapons focus is a cognitive bias that USG senior policymakers seem to have developed from decades of experience dealing with nuclear threats versus comparatively little experience with radiological threats. A long history of combating all things nuclear, from a weapons standpoint (e.g., nuclear brinkmanship with the Soviet Union during the Cold War) and a proliferation standpoint (e.g., dealing with Iran and North Korea today) has produced a level of familiarity with nuclear security issues that has

\textsuperscript{136} Cesium-137 is a gamma-emitter which causes an external health hazard (i.e., does not have to be ingested to cause radiation health effects). Its longer half-life (30 years) means that its radioactivity remains stronger for a much longer period of time than, say, polonium-210 (with a 140-day half-life). Argonne National Laboratory, “Radiological Dispersal Device (RDD).”

\textsuperscript{137} Interview with Mr. William B. Daitch, Assistant Director, DHS/DNDO. It should be noted that COL (P) Bentz cited the Litvinenko case in the opposite way, arguing the consequences were easily managed.

extended to the fight against the newer WMD terrorism threat. This is evident, for instance, in post-9/11 speeches by DoD leadership, in which the focus is largely on the traditional nuclear deterrent mission and the threat from state actors pursuing nuclear weapons, as well as the threat from nuclear, biological, and chemical terrorism – with little mention of radiological.

The concept of radiological terrorism is a comparatively new one, with the majority of pre-9/11 activities addressing radiation from a public health and safety standpoint in the context of isolated radiation dispersion _accidents_ – not the malicious use of radioactive materials as a weapon. The nuclear problem is better understood and USG efforts to combat it are more institutionalized; the DoD CTR program referenced in Part One, for example, has received billions of dollars in support since its inception in the 1990s and continues to experience budget increases. It may simply take more time for strategic USG thinking to further evolve in considering the significance of the radiological threat. It takes a long time, for example, to establish enduring line-items in congressional budgets. The radiological threat is still new and thus does not receive much public or media attention – in stark contrast to a nuclear threat that is much more “out there,” with Osama bin Laden threatening an “American Hiroshima.”

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139 Interview with Mr. William Ulicny, Program Manager, DHS/DNDO.
141 Interview with Mr. David Chamberlain, Chemical Engineer and Department Manager, National Security, Argonne National Laboratory. It should be noted that COL (P) Bentz believed the opposite, that there is actually a level of familiarity with the radiological threat because the USG has been dealing with radiation for years (e.g., NRC in its regulatory/safety role), whereas nuclear materials have always been locked away in weapons programs and thus much less familiar.
142 Martin Matishak, “Threat Reduction Program Edges Closer to $100M Budget Increase.”
143 Interview with Mr. David Chamberlain, Chemical Engineer and Department Manager, National Security, Argonne National Laboratory.
144 Interview with Mr. Ryan Connelly, Program Analyst, DHS/DNDO.
AQ Khan running a nuclear proliferation ring, and civilian use of nuclear fuel quickly spreading.\(^{145}\) The nuclear threat is simply more prevalent.

*We’ve Got It Covered: Rad as a Part of Nuke*

The third factor contributing to the strategic-level USG focus on the nuclear threat is the treatment of radiological terrorism as a subset of nuclear terrorism, rather than a threat in its own right that deserves dedicated attention. Some U.S. officials believe that the government’s focus is not actually on nuclear at the expense of radiological but that all of the efforts targeting the nuclear threat cover the radiological threat as well, especially on the prevention side (e.g., detection and source security). COL (P) Julie Bentz, a senior Army National Guard officer and Ph.D. nuclear engineer who has extensive experience working nuclear and radiological issues at both the strategic and operational levels, emphasized in an interview that “with combating nuclear terrorism, you are building capabilities for both nuke and rad.”\(^{146}\) She argued that *more* work has actually been done on the radiological side, but it is less apparent because it has been parsed out over a larger community in which multiple agencies each lead a focused piece of the mission. Thus, special attention, policy, and/or rhetoric may not be needed at the presidential level because the problem is already being sufficiently addressed.\(^{147}\)

It is true that the nuclear and radiological threats are closely related from a scientific standpoint, enabling the USG to employ dual-benefit solutions to simultaneously address key aspects of both threats. However, several unique aspects of preventing and responding to a radiological attack render it a distinct problem that must be addressed as such. In terms of prevention, the United States is especially vulnerable to a radiological attack given the size and scope of the problem. This reality means that targeted radiological source security efforts are

\(^{145}\) Interview with Mr. William B. Daitch, Assistant Director, DHS/DNDO.  
\(^{146}\) Interview with COL (P) Julie Bentz, Army National Guard.  
\(^{147}\) Ibid.
critical. In addition, detection efforts are more heavily focused on finding materials at domestic and international borders than inside the United States\(^ {148}\) – a strategy that is more appropriate for addressing the nuclear threat, as nuclear materials are highly secured inside the country and would almost certainly have to be smuggled in for an attack. The wide availability of radioactive materials that could be used in a radiological weapon thus necessitates focused attention on promulgating radiation detection capabilities to state and local communities across the country, which DHS/DNDO is leading.

Still, the primary purpose of the majority of detection efforts is to find nuclear materials\(^ {149}\), which are much more difficult to acquire and detect than highly radioactive sources. The USG has chosen to focus its resources to date on the harder problem with the smaller scope\(^ {150}\).

In terms of response, there are more permanent contamination and area of denial issues unique to radiological sources, which are more highly radioactive and longer-lasting than faster-decaying special nuclear materials. DHS thought it necessary to create two distinct National Planning Scenarios for an improvised nuclear device and an RDD, but exercises to date have not focused on RDD-specific consequences, such as the unique decontamination and long-term cleanup aspects that could be much more severe with an RDD because of the isotopes involved\(^ {151}\). Affected infrastructure could be so highly contaminated that it must either be

\(^{148}\) Interview with Mr. Ryan Connelly, Program Analyst, DHS/DNDO.

\(^{149}\) Ibid.

\(^{150}\) Because of these issues, Charles Ferguson recommended that DHS re-prioritize its detection program: "My understanding as a physicist, as a scientist, looking at the radiation detection capability today that they have, I would recommend to them to prioritize the dirty bomb problem." Charles Ferguson, TESTIMONY: A Review of U.S. International Efforts to Secure Radiological Materials. DHS/DNDO program analyst Ryan Connelly agreed, advocating not for a wholesale priority shift but for an expansion of detection efforts specific to the radiological threat within the United States.

\(^{151}\) DHS, National Preparedness Guidelines 31 and Interview with Dr. Kevin Carney, Nuclear Nonproliferation Division, Idaho National Laboratory.
cordoned off for a long period of time or destroyed, creating another unique challenge to dispose of huge amounts of contaminated rubble. DHS/DNDO Assistant Director Bill Daitch underscored the impact of these distinct features of response to a radiological attack: post-RDD, “Who’s ever going to want to move back?” 152

These characteristics of the radiological threat, which distinguish it from the nuclear threat and show that it is dangerous in its own right, make targeted radiological counterterrorism initiatives absolutely essential. We saw in Part One that departments and agencies are making an effort but that a number of inefficiencies have not been corrected and several capability gaps have not been filled. This is not surprising considering the lack of direction coming from above. Rather than mandating an effective, concerted government effort to develop solutions, disinterest at the strategic level has added to the problem.

CONCLUSION

Policy Implications: So What?

This study demonstrates the existence and underlying causes of a failure that might otherwise only be exposed in the aftermath of a radiological terrorist attack – the failure of the federal government to adequately address the threat. This critical assessment of the post-9/11 USG level of effort provides policymakers an opportunity to consider current shortcomings, understand their causes, and correct them before an attack occurs. This consideration could and should motivate an important shift toward increased focus and funding at a level commensurate with the radiological threat. Additional research involving a more direct comparison of all ongoing radiological counterterrorism efforts with nuclear (and even chemical and biological)
counterterrorism efforts would be useful in more precisely assessing the attention deficit on the radiological side, evaluating what constitutes an appropriate level of effort on each threat in relation to the others, and calculating what exactly that means in terms of a re-balancing of combating WMD resources.

The results of this study show that a disjuncture does in fact exist between the significance of the radiological threat and USG efforts to counter it. While the intelligence, academic, and scientific communities agree that the threat is real, and departments and agencies acknowledge that it must be addressed, current operational activities are not getting the job done. Intra- and interagency mission space conflicts and inadequate funding have caused major deficiencies in a number of key areas, including alternative technology development and unwanted/orphan source recovery and disposal on the prevention side, and first responder preparedness, exercise planning and execution, long-term recovery, and public outreach on the response side.

Moreover, a disconnect at the highest levels of government has compounded these operational issues. The White House has shown little interest in radiological strategy or policy, while Congress has talked about the threat at length without taking much meaningful action. At this strategic level, the USG has chosen to focus on combating nuclear (versus radiological) terrorism because of an emphasis on the importance of consequences, a greater familiarity with nuclear threats, and a belief that nuclear counterterrorism efforts sufficiently address the radiological problem. Ultimately, the absence of both a presidential and congressional mandate and associated funds has left departments and agencies unable to overcome bureaucratic obstacles that stand in the way of truly effective radiological counterterrorism efforts.

The bottom line is that the threat of radiological terrorism is a manageable problem. A reasonable level of dedicated USG focus on and investment in radiological prevention and
response could make it much more difficult for terrorists to access and transport the materials necessary to build a weapon, and much less likely that they would achieve the desired impact in the aftermath of an attack. This is a good thing. Yet, it makes the current USG neglect even more unacceptable. The government has no excuse for failing to comprehensively address the radiological threat.

**Policy Recommendations: Now What?**

The current overall level of effort is not sufficient. However, the USG can easily build upon productive efforts that are ongoing within individual departments and agencies. All it will take is for an influential advisor at the White House and a senior policymaker in Congress to decide the radiological threat is important enough to address with the attention it deserves. Concrete tailored plans, better coordination, and increased resources will flow from there, and modest plus-ups in radiological-focused funding could yield a high return in enhanced security. Strategic-level attention is the only thing that can effectively kick-start a more vigorous effort, and it is absolutely necessary – just consider the accomplishments presidential priority has facilitated on the nuclear counterterrorism side in just the past year-and-a-half.

I recommend the following four-step action plan:

1. **Revise current USG national-level strategy for combating nuclear terrorism to include specific treatment of the radiological threat**, from prevention through long-term recovery, to include all responsible departments and agencies. This revision could easily be mandated by Congress (especially given members’ continued interest in the radiological threat), with a firm deadline. DHS should take the lead because of its important role across the mission spectrum. The strategic planning process would force the agencies with unresolved mission confusion and avoidance issues to resolve them and finally figure out how to address the lingering, unclaimed gaps in capability. As COL (P) Julie Bentz put it, “The more agencies
work together, the better they get at it.”\textsuperscript{153} The new, more comprehensive strategy should be signed by the President.

2. The White House should then mandate the responsible agencies to complete more detailed interagency Implementation Plans for each major effort area – prevention, response, and recovery (which should be broken out since it needs the most work). These Plans would detail how the departments will achieve the objectives outlined in the national strategy.

3. The revised strategy should be accompanied by a rebalanced presidential budget request, followed by commensurate congressional appropriations, for radiological-focused programs. Modestly increased funding will enable agencies to accelerate ongoing activities and address new efforts.

All of this could be accomplished in a short timeframe.

4. Finally, the USG (again led by DHS) should undertake an enhanced communications campaign in parallel with the first three broader efforts. A 2005 Defense Science Board study assigned a key recommendation to the Secretaries of Defense and Homeland Security, as well as to the U.S. President, to “publicly articulate the situation regarding terrorist use of WMD clearly and honestly, with realistic assessment and guidance, to gain and maintain public support and to increase the sense of urgency.”\textsuperscript{154} The same report estimated the level of USG investment in this area to be at only 10 percent of what was needed.\textsuperscript{155} The new campaign should have three prongs:

a. Strategic communications (audience: adversaries) – The United States is losing out on the potential deterrence value of a robust, well-publicized radiological

\textsuperscript{153} Interview with COL (P) Julie Bentz, Army National Guard.
\textsuperscript{155} Ibid. 55.
counterterrorism capability by failing to even acknowledge the good programmatic efforts – much less proactively communicate them – in strategic-level policies, plans, and rhetoric.\footnote{COL (P) Bentz made an interesting counterargument to this point: “Good news stories on rad point to bad news stories on nuke.” Publicizing how good the USG is on the radiological side exposes all of its shortcomings on the nuclear side (i.e., how easy radioactive materials are to detect highlights how difficult nuclear materials are to detect; how well we have radiological materials under regulatory control highlights how much loose nuclear material is out there). However, she did agree that the USG should aim to convey a sense that “we’ve got the rad threat covered.” Interview with COL (P) Julie Bentz, Army National Guard.}

b. Public communications (audience: American people) – The USG needs a more robust, organized, well-coordinated public outreach campaign to raise the baseline level of understanding on the radiological threat before an attack occurs. This will likely go a long way toward mitigating chaos and panic during an incident. “Ready.gov” isn’t going to cut it – the country needs a proactive effort that raises public awareness through increased involvement of private citizens in homeland security. A first step could be requiring local governments to recruit volunteers to participate in small-scale radiological emergency response exercises. This kind of active involvement could help individuals better understand what to do in the aftermath of a radiological attack.

c. Media communications (audience: media) – The USG needs a pre-coordinated government-to-media link-up plan, to be carried out immediately following a radiological attack. Specific points of contact should be identified at media outlets and within government agencies to facilitate the efficient, accurate communication of critical information at the national level.
The implementation of this plan could provide a solid foundation for the sustained enhancement of USG efforts to reduce the risk of radiological terrorism. DHS/DNDO Program Analyst Ryan Connelly summed it up: “You’ve got to be able to lock [the threat] down, and if you can’t be 100 percent successful in locking it down, you’ve got to try to detect it, and if you can’t be 100 percent successful in detecting it, you’ve got to be able to deal with it.” The American public will demand an explanation if the USG fails on any one of those accounts, much less all three – and the president will not have any satisfactory answers to offer, except to promise he will not let it happen again. And then, the strategy, and rhetoric, and money will flow down in spades. What will it take? 

Interview with Mr. Ryan Connelly, Program Analyst, DHS/DNDO. 

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### APPENDIX A: ACRONYM LIST

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>CBRN</td>
<td>Chemical, Biological, Radiological, Nuclear</td>
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<tr>
<td>CTR</td>
<td>Cooperative Threat Reduction</td>
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<tr>
<td>DHS</td>
<td>U.S. Department of Homeland Security</td>
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<tr>
<td>DNDO</td>
<td>Domestic Nuclear Detection Office</td>
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<tr>
<td>DoD</td>
<td>U.S. Department of Defense</td>
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<tr>
<td>DOE</td>
<td>U.S. Department of Energy</td>
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<tr>
<td>DOS</td>
<td>U.S. Department of State</td>
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<tr>
<td>EPA</td>
<td>U.S. Environmental Protection Agency</td>
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<tr>
<td>FBI</td>
<td>Federal Bureau of Investigation</td>
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<tr>
<td>FEMA</td>
<td>Federal Emergency Management Agency</td>
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<tr>
<td>GAO</td>
<td>U.S. Government Accountability Office</td>
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<tr>
<td>GTRI</td>
<td>Global Threat Reduction Initiative</td>
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<tr>
<td>HHS</td>
<td>U.S. Department of Health and Human Services</td>
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<tr>
<td>IC</td>
<td>U.S. Intelligence Community</td>
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<tr>
<td>NNSA</td>
<td>National Nuclear Security Administration</td>
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<td>NRC</td>
<td>U.S. Nuclear Regulatory Commission</td>
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<tr>
<td>OSRP</td>
<td>Off-Site Recovery Project</td>
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<tr>
<td>RDD</td>
<td>Radiological Dispersal Device</td>
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<tr>
<td>S&amp;T</td>
<td>Science and Technology</td>
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<tr>
<td>TOPOFF</td>
<td>Top Officials Exercise</td>
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<tr>
<td>USG</td>
<td>U.S. Government</td>
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<tr>
<td>WMD</td>
<td>Weapons of Mass Destruction</td>
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APPENDIX B: DEPARTMENT AND AGENCY ROLES AND RESPONSIBILITIES

The following is an overview of the major roles and responsibilities for combating radiological terrorism of the executive branch departments and agencies discussed in this study.

### Department and Agency (D/A) Roles and Responsibilities

<table>
<thead>
<tr>
<th>D/A</th>
<th>PREVENTION</th>
<th>RESPONSE</th>
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</thead>
</table>
| DHS | • Leads domestic incident response, which includes preventing, preparing for, responding to, and recovering from terrorist attacks, major disasters, or other emergencies\(^{158}\)  
• Leads detection/prevention of nuclear or radiological (nuc/rad) attacks at U.S. borders or within U.S.\(^{159}\) | • Leads domestic incident response, which includes preventing, preparing for, responding to, and recovering from terrorist attacks, major disasters, or other emergencies. Includes response to all deliberate attacks involving nuc/rad facilities or materials, including RDDs and improvised nuclear devices.\(^{160}\) |
| DoD | • Implements activities to prevent proliferation and counter WMD, including detecting, interdicting, and locking down nuc/rad materials at their source\(^{161}\) | • Leads coordination of response to incidents involving nuc/rad materials or facilities owned or operated by DoD\(^{162}\)  
• Supports domestic consequence management through military support to civil authorities, including deployment of specialized DoD consequence management teams\(^{163}\) |
| DOE | • Implements activities to detect, prevent, and reverse proliferation of nuc/rad materials, including interdicting, securing, and disposing of nuc/rad materials around the world\(^{164}\) | • Leads coordination of response to incidents involving nuc/rad materials or facilities owned or operated by DOE\(^{165}\)  
• Supports domestic consequence management through radiological monitoring and assessment capabilities and deployment of specialized radiological response teams\(^{166}\) |
| DOS | • Leads coordination of international activities related to preventing, preparing for, responding to, and recovering from domestic incidents and for protection of U.S. citizens/interests overseas\(^{167}\) | • Leads coordination of international activities related to preventing, preparing for, responding to, and recovering from domestic incidents and for protection of U.S. citizens/interests overseas\(^{168}\) |

\(^{158}\) HSPD-5, Management of Domestic Incidents.  
\(^{161}\) DoD, Quadrennial Defense Review Report 34.  
\(^{163}\) HSPD-5, Management of Domestic Incidents and DoD, Quadrennial Defense Review Report 19 and 36.  
\(^{164}\) DOE, DOE Strategic Plan, Washington: DOE, 2006 and NNSA, Office of Global Threat Reduction Strategic Plan.  
\(^{166}\) Ibid. 14-16.  
\(^{167}\) HSPD-5, Management of Domestic Incidents.  
\(^{168}\) Ibid.
<table>
<thead>
<tr>
<th>Agency</th>
<th>Role</th>
<th>Notes</th>
</tr>
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<tbody>
<tr>
<td>EPA</td>
<td>Leads coordination of federal environmental response to domestic incidents that occur at facilities not licensed, owned, or operated by a federal agency or Agreement State, including environmental monitoring capabilities and deployment of EPA Radiological Emergency Response Team&lt;sup&gt;169&lt;/sup&gt;</td>
<td>Offers services related to incident management.</td>
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<tr>
<td></td>
<td>Assists in development of long-term recovery plan&lt;sup&gt;170&lt;/sup&gt;</td>
<td>Provides support in disaster recovery scenarios.</td>
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<tr>
<td></td>
<td>Leads coordination of domestic response to incidents involving materials or facilities licensed by NRC or Agreement States&lt;sup&gt;177&lt;/sup&gt;</td>
<td>Focuses on internal response to incidents.</td>
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<tr>
<td>FBI</td>
<td>Leads criminal investigations of terrorist acts/threats inside U.S. or against U.S. citizens/institutions abroad, and related intelligence collection activities in U.S.&lt;sup&gt;171&lt;/sup&gt;</td>
<td>Specializes in law enforcement activities.</td>
</tr>
<tr>
<td>HHS</td>
<td>Provides emergency medical treatment for radiation exposure, medical countermeasures through deployment of Strategic National Stockpile, and long-term population monitoring&lt;sup&gt;173&lt;/sup&gt;</td>
<td>Focuses on medical response and preparedness.</td>
</tr>
<tr>
<td>IC</td>
<td>Works to counter proliferation of WMD and means of delivery by state/non-state actors through dissuasion, prevention, rollback, and deterrence&lt;sup&gt;174&lt;/sup&gt;</td>
<td>Engages in international security initiatives.</td>
</tr>
<tr>
<td></td>
<td>Works to counter proliferation of WMD and means of delivery by state/non-state actors through consequence management (e.g., characterization of adversary capabilities, development of countermeasures, and attribution)&lt;sup&gt;175&lt;/sup&gt;</td>
<td>Focuses on post-incident consequences.</td>
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<sup>168</sup> HSPD-5, Management of Domestic Incidents.
<sup>170</sup> Ibid. 31.
<sup>171</sup> HSPD-5, Management of Domestic Incidents.
<sup>172</sup> Ibid.
<sup>175</sup> Ibid. 7.
<sup>176</sup> U.S. NRC, Strategic Plan: Fiscal Years 2008-2013.
APPENDIX C: RESEARCH NOTE

This study attempts to add value to the existing literature by taking a systematic look at whether USG operational activities are effective at reducing risks and vulnerabilities. I conducted an in-depth examination of federal radiological counterterrorism efforts post-9/11 in order to evaluate how well these efforts are addressing the threat. Specifically, I explored movement on the problem at two levels – the operational (i.e., executive branch departments and agencies) and the strategic (i.e., the White House and Congress). First, I analyzed operational efforts supporting two key areas – prevention and response. Using the extensive evidence gathered through this analytical process, I then assessed apparent causes of ineffectiveness in each area. Finally, I examined presidential policy, strategy, and rhetoric, as well as congressional legislation and oratory, to determine how strategic-level developments could be impacting operational programs – for better or for worse.

I began my research with an assumption that disjuncture or ineffectiveness would be evident across the board primarily due to USG distraction by the threat of nuclear terrorism. It appeared that strategic-level disinterest could be compounding implementation problems within and between departments and agencies on specific radiological counterterrorism programs. To explore the validity of this assumption in the context of the full range of evidence, I examined all possible contributing causes through the analysis of numerous primary government sources such as policy, strategy, programmatic, and budget documents; legislation; congressional testimony; government-commissioned reviews; and expert interviews.

Throughout the course of the study, I discovered two additional factors that were critical in causing operational deficiencies, particularly in the area of response. The evidence also showed that a strategic-level focus on the nuclear over the radiological threat had in fact contributed to the operational problems; thus, my original assumption was partially correct.
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Dr. Kevin Carney, Nuclear Nonproliferation Division, Idaho National Laboratory, on 4 October 2010.
Mr. David Chamberlain, Chemical Engineer and Department Manager, National Security, Argonne National Laboratory, on 4 October 2010.
Mr. William B. Daitch, Assistant Director, U.S. Department of Homeland Security Domestic Nuclear Detection Office, on 7 October 2010. Mr. Daitch is a nuclear engineer, Captain in the U.S. Navy Reserve, and member of the Senior Executive Service.
Mr. Jeffrey Leggitt, Supervisory Special Agent, Federal Bureau of Investigation, on 7 October 2010. Mr. Leggitt leads the FBI’s Hazardous Materials Response Team.
Mr. William Ulicny, Program Manager, U.S. Department of Homeland Security Domestic Nuclear Detection Office, on 7 October 2010. Mr. Ulicny is a health physicist who previously supported the DoD Defense Advanced Research Projects Agency.
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