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Coping with Nuclear Terrorism and Nuclear Weapons Proliferation

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Imagine the day after 9/11 if instead of flying planes into the Twin Towers, terrorists had detonated a 10 kiloton nuclear weapon (about the size of the Hiroshima bomb) in midtown Manhattan. A catastrophe of untold death and destruction would still be unfolding. Nothing would have saved the hundreds of thousands, possibly more than a million, New Yorkers murdered by the initial blast, fireball, and radiation.¹ Millions more would survive, only to face fires, as well as lethal and spreading radioactive fallout, among other hazards. These living victims could not depend on first responders to help them in the crucial minutes and hours after the blast. Power, phones, and access to the Internet would be knocked out in the area. Emergency personnel outside the affected zone would need time to mobilize and respond in chaotic and dangerous conditions. Contemplating the day after *this* 9/11 makes one grateful that the real 9/11, though catastrophic, was not worse than it was. This scenario of a nuclear attack resulting from nuclear weapons falling into the wrong hands of terrorists or “rogue state” actors has steeled U.S. policymakers’ resolve to prevent such an event from happening.²

A terrorist nuclear attack is the paradigmatic low-probability, high-cost event,³ but nuclear dangers and risks have been increasing in recent years.⁴ North Korea tested its first nuclear weapon in 2006 after withdrawing from the Non-Proliferation Treaty (NPT) in 2003; Iran refused to stop its uranium enrichment program and was placed under United Nations Security Council sanctions (scheduled to be removed under the terms of the July 2015 nuclear agreement that delays for more than a decade Iran’s nuclear “breakout” time); Al-Qaeda and other jihadist groups are known to be interested in acquiring nuclear weapons and materials; suspected nuclear facilities in Pakistan have been attacked; nuclear technology has been transferred by Pakistan and North Korea; illegal nuclear programs were exposed in Iraq (1991), Iran (2002), Libya (2003), and Syria (2007); and a long list of nuclear security and control incidents and failures has been documented. According to a recent study, four of the nine states (or nearly 50 percent) that built nuclear arsenals have experienced “severe political crises affecting nuclear security and/or control of use.”⁵

The threat of nuclear terrorism differs markedly from the spectre of nuclear Armageddon in the Cold War when the superpowers developed assured destruction postures and capabilities that deterred nuclear use. Because terrorists are not easily or fully deterrable, preventing their acquisition of nuclear weapons and other weapons of mass destruction (WMD) and employment, if acquired, are leading policy objectives. Potential nuclear proliferation to nonstate terrorists and rogue actors involves factors relating both to the supply of nuclear materials and technologies and demand from groups that are motivated to acquire nuclear weapons and exploit available opportunities to do so. Although it would not be easy, a motivated terrorist group might be able to steal a nuclear warhead and overcome the security safeguards blocking its operational use. Or more likely, terrorists could acquire nuclear materials in the form of plutonium or highly enriched uranium (HEU) to produce a weapon of approximately 10 kilotons, similar to the Hiroshima device, by gaining design plans from a proliferation smuggling ring like the one started by A.Q. Khan in Pakistan.⁶

The low probability of a terrorist nuclear attack constrains policy planning and encourages public complacency. But the difficulties terrorists and rogue actors encounter are also numerous, many the result of policies which collectively have helped to prevent a nuclear 9/11 on American soil or in other countries.⁷ Even if policymakers effectively extend and adapt existing measures, there is still no guarantee that terrorists will not succeed in striking with nuclear or other weapons of mass destruction (WMD). In this event, civil defense measures could play a vital role in limiting the extent of the damage. The 2014 “National Defense Strategy for Countering Weapons of Mass Destruction” summarizes the comprehensive objectives to “reduce incentives to pursue, possess, and employ WMD; increase barriers to the acquisition, proliferation, and use of WMD; manage WMD risks emanating from hostile, fragile, or failed states and safe havens; and deny the effects of current and emerging WMD threats through layered, integrated defenses.”⁸ This chapter explores the challenges inherent in limiting the spread of nuclear weapons while pursuing other U.S. strategic interests, and considers policies to achieve this objective and mitigate the effects of failures. In particular, it examines the role of the international nuclear nonproliferation regime and counterproliferation mechanisms in the context of American strategic objectives. At the end it returns to the question of civil defense in the event of a terrorist nuclear attack on American soil.

I. Proliferation, Terrorism and Policy Responses

The threat posed by nuclear weapons has been at the forefront of international security since their advent and first use by the United States during World War II. American presidents have consistently sought to limit nuclear proliferation, starting with a 1946 statute that prohibited the transfer of nuclear weapons to other states. President Harry Truman declared that the United States alone “must constitute ourselves trustees of this new force” and even the subsequent Baruch Plan to invest control over all nuclear materials with a new U.N. body insisted that the United States would retain its nuclear bombs until the new agency created reliable mechanisms for international control and intrusive inspections.⁹

After the Soviet Union crossed the nuclear threshold, attention turned to other cooperative methods of limiting their spread. President Dwight Eisenhower’s 1953 “Atoms for Peace” proposal, which envisioned redirecting nuclear research from military requirements to peaceful, economic development, eventually produced the authorization in 1956 for the International Atomic Energy Agency (IAEA). The IAEA was tasked with providing information and assistance to countries to use nuclear energy for peaceful purposes and conducting inspections of their nuclear facilities to guard against diversion of uranium fuel and plutonium produced by reactors to military pursuits. A 1961 U.N. resolution unanimously authorized negotiation of a treaty that would ban countries without nuclear weapons from acquiring them and require IAEA inspections. This process resulted in a set of international agreements anchored by the Nuclear Nonproliferation Treaty (NPT) which was signed on July 1, 1968, and entered into force on March 5, 1970.¹⁰ Since their inception these legal agreements have faced challenges, especially Pakistan’s test of a nuclear weapon in 1998, North Korea’s nuclear test in 2006, and Iran’s covert nuclear program.

In retrospect, although Eisenhower’s Atoms for Peace initiatives contributed to the norm of nuclear nonproliferation and eventual NPT regime, they also had the negative impact of accelerating the international diffusion of scientific and industrial nuclear technology. In the 1950s, the United States actively promoted nuclear energy exports and technological agreements with more than 24 states. Enforcement of safeguards by Washington, other nuclear suppliers, and the IAEA, was inadequate. Perhaps inevitably, U.S. nuclear assistance was diverted to military purposes, notably by Israel, India, and Pakistan.¹¹

Trade and technological globalization lower the threshold for the development or acquisition of WMD not only for states, but also possibly for substate or nonstate groups. Discussions about supply-side issues, opportunities for

nuclear programs to develop, and opportunities for terrorists to acquire nuclear materials and weapons, must take into consideration the large and growing nuclear power industry throughout the world. The risks associated with nuclear power, which include those pertaining to facility safety, the availability of nuclear material, and the spread of nuclear engineering know-how, are a critical component of the nuclear-power debate. The nuclear power industry is also the source of many dual-use materials, which are components that can be used for both licit and illicit nuclear programs.¹² There is also an industry around nuclear and radiological materials in science and medicine that creates concerns for smaller-scale threats.

India had used the technology and materials acquired under the Atoms for Peace process to build and test its first nuclear device in 1974 and become a nuclear weapons state in 1998.¹³ However, the Pakistani test, in particular, ushered in a new series of concerns about nuclear weapons in international security and raised questions about the value of the NPT regime.¹⁴ Pakistan's nuclear weapons program took many observers by surprise, despite the fact that the country had been seeking to achieve technological parity with its regional adversary India. The source of surprise did not lie with Pakistan's intent, because the country had never signed the NPT, but in their ability to develop a weapon with minimal support from the existing nuclear powers.¹⁵ Pakistan's capacity to cross the nuclear threshold by using informal networks and dual-use material made it clear that cooperative measures like the NPT represented only one approach to the problem—and one that would not be sufficient to stem the spread of nuclear weapons in the future.

The detonation of Pakistan's nuclear weapon also coincided with an increase in militant Islamic terrorism marked by the African embassy bombings in 1998, the USS Cole bombing in 2000, and the September 11 attacks against the United States in 2001.¹⁶ Concerns about the spread of nuclear technology fused with those of increased large-scale terrorist activity, rekindling discussions of the threat from nuclear terrorism. The George W. Bush administration, which perceived intense homeland vulnerability while overrating the benefits of an aggressive use of U.S. military power,¹⁷ responded with a strategy that emphasized preemptive and preventive strikes against both terrorists and rogue states, notably Iraq.¹⁸ The idea of preventive war harkened back to the Cold War, and Bismarck is often quoted as saying "preventive war is like committing suicide for fear of death." In 1994 the Clinton administration came close to launching preventive strikes against North Korea to prevent its development of a nuclear

capability.¹⁹ Although the Obama administration has backed away from preventive war against rogue states, the emphasis on *counter*proliferation and preemptive strikes against terrorists remains a central element of American policy. President Obama recently reaffirmed in the 2015 National Security Strategy, “No threat poses as grave a danger to our security and well-being as the potential use of nuclear weapons and materials by irresponsible states or terrorists.”

Two of the United States’ most pressing national security issues, the nuclear programs in Iran and North Korea, lie at the intersection of nonproliferation and counterproliferation. Both states have challenged the principles that undergird the cooperative approach of the NPT by signing the convention and then either withdrawing from or violating the agreement. Since both countries appear undeterred in their quest for nuclear weapon capabilities, U.S. and international policymakers often resort to countervailing measures such as denying resources, stifling technological advancement, and imposing costs as inducements for international negotiations to achieve compliance.

II. The Nuclear Nonproliferation Treaty and the Small Number of Determined Proliferators

The NPT is the centerpiece of international efforts to limit the spread of nuclear weapons. One theory behind nuclear arms control and the NPT comes from the idea of rational cooperation under anarchy.²⁰ The treaty only works when countries feel they are better off not having nuclear weapons, as long as other countries (excluding the five nuclear weapons states) do not have them as well. Institutionalized cooperation assumes strategic interaction with other states: country A may be better off with nuclear weapons provided their neighbor country B does not have them, but once country B acquires nuclear weapons then country A would have been better off had neither pursued that course. Mutual cooperation becomes a stable state over an infinite number of plays. The treaty and associated regime is built on mutual or multilateral cooperative interests, information to identify violations, and enforcement mechanisms or punishments should a signatory violate its obligations. However, the NPT also has elements best explained by two other international relations theories. According to constructivism, norms reflect the logic of appropriateness of particular types of international behavior, such as a taboo against using nuclear weapons or the value placed by many members of the international community on a world without nuclear weapons.²¹ Realism also has explanatory power

to the extent that the most powerful actors prefer to create institutions that advance their interests and bind others while permitting maximum flexibility for the rule-makers and first movers.²²

The three mainstays of the NPT are non-proliferation, disarmament, and the peaceful use of nuclear energy. The five recognized nuclear powers in the treaty correspond to the five permanent members of the United Nations Security Council: China, France, Russia, the United Kingdom, and the United States. The NPT embodies the norm of nuclear abstinence, excluding the five nuclear powers, which are supposed to be on the path of arms reductions. Moreover, the NPT's requirements for safeguards, including IAEA inspections of nuclear power facilities, remain a requirement for receiving peaceful nuclear assistance and have caught cheaters and countries pursuing suspicious weapons-related activities (e.g., Iran, North Korea, South Korea, and Egypt).²³

It is undeniable that the NPT has *not* prevented the most determined proliferators from getting the bomb and helped shield violators that joined to conceal their illegal nuclear programs. However, measured against the larger sample of about 200 countries that could have become nuclear weapons states but chose not to, or reversed initial programs, its role should not be discounted.²⁴ For example, South Africa abandoned its nuclear weapons program while the three former Soviet republics of Ukraine, Belarus, and Kazakhstan agreed to give up their stockpiles after the collapse of the Soviet Union and joined the NPT.

In addition to the five countries identified in the NPT as nuclear weapons states, three additional states, as mentioned above, possess nuclear weapons and are unwilling to relinquish their nuclear status. India successfully tested a nuclear weapon in 1974; Pakistan followed in 1998, and India then tested a more advanced fusion weapon in 1998. Israel also has an undeclared nuclear capability. None of these countries signed the NPT, meaning that their nuclear activities were not violations of treaty obligations. As a rising regional power with growing energy needs, India's challenge to the NPT regime is perhaps the most significant. In recent years, Delhi has shown responsible behavior, complying with the 2006 U.S.-India civil nuclear agreement that requires India to separate its civil and military nuclear facilities and place the former under IAEA safeguards. Aiming to supply 25 percent of its electricity from nuclear power by 2050, India seeks to join the Nuclear Suppliers Group (as well as the Missile Technology Control Regime), but still prefers to remain outside the NPT.

Beyond these eight countries, the two states with active nuclear programs at different stages of development are North Korea and Iran, both of which were signatories of the NPT at one time. Their activities have put them in

violation of their obligations and they are widely considered rogue regimes. North Korea has an ongoing nuclear weapons program, is capable of enriching uranium and producing weapons-grade plutonium, and has tested nuclear explosive devices in 2006, 2009, and 2013. Pyongyang withdrew from the NPT in 2003, but previously managed to subvert international inspections by running parallel programs for both plutonium and highly-enriched uranium with most of the international attention focused on the Yongbyon plutonium reactor. It is believed to possess up to ten nuclear weapons.

Unlike North Korea, Iran has not withdrawn from the NPT and claims that its current nuclear activities are consistent with the treaty in permitting development of nuclear energy. Iran, a leading oil-producing state, argues that it wishes to reserve its petroleum stock for export and meet its domestic energy needs through nuclear power. Despite this claim, Iran has blocked inspections of many nuclear facilities, and the IAEA found Iran in violation of their treaty obligations. The 2015 landmark agreement between Iran and the P-5 permanent members of the U.N. Security Council plus Germany (under review by the U.S. Senate, as of this writing) significantly restricts Iran's path to acquiring nuclear weapons for 10 years but could leave Tehran in the position of a breakout capability when the treaty expires. Partly related to these cases, there is concern that a new nuclear weapons cascade could occur, particularly in the Middle East and Asia, with demand-side dynamics tied in with geopolitical tensions and other factors.

III. Nuclear Capable States

Two final categories of states also play an important role in nuclear proliferation. Many states have the nuclear material and scientific capabilities to develop nuclear weapons in a matter of months, putting them in the category of latent nuclear weapons states. Germany and Japan, for example, could probably become nuclear weapons states in less than a year. Other countries that could probably cross the weapon threshold quickly include Canada, South Korea, and Taiwan.

Several officials and analysts have warned of the security risks arising from the spread of uranium enrichment and plutonium fuel-production facilities and the emergence of many "virtual nuclear weapons states" with the capacity to develop nuclear weapons in a very short time period.²⁵

The final category is composed of "nuclear reversal" states that have voluntarily given up nuclear ambitions after investing in weapons programs or seriously explored the nuclear option but reconsidered. Some of the notable

examples include South Africa, Libya, Brazil, and Argentina. Three former Soviet states (Ukraine, Belarus, and Kazakhstan) opted to relinquish nuclear weapons left from the Soviet occupation after a lengthy negotiating process in the early 1990s. Why states forego nuclear weapons programs or give them up after initially pursuing them is a puzzle with many possible explanations (ranging from inducements to dissuasion, coercion and economic sanctions) that may vary from case to case²⁶

IV. U.S. Strategy and Nuclear Nonproliferation Policy

The policy of nonproliferation has been the diplomatic and legal cornerstone of American nuclear policy since the 1950s. The U.S. gains strategic benefits from promoting nonproliferation norms and mechanisms, including arms control, to demonstrate its compliance with NPT provisions and lessen perceptions of American hegemony and hypocrisy. President Obama's promulgation of a Global Zero policy is widely credited with attempting to elevate the goals of the nonproliferation regime, although this campaign is not unique and it is doubtful it makes an impact on strongly committed terrorists. All U.S. presidents, except George W. Bush, have advocated the eventual elimination of nuclear weapons²⁶ and developed nonproliferation and counterproliferation mechanisms to prevent the further spread of other actors' nuclear weapons. The United States has also pursued nuclear arms control with the Soviet Union and Russia to reduce their arsenals despite adversarial or conflictual relations. In both cases, the practical benefits accrue to the United States, above all in military mission requirements given its dominance in global conventional strike capabilities.

The reality of American nuclear policy is complicated and not without contradictions and associated risks. For example, the 2010 U.S. Nuclear Posture Review identified the "fundamental role" of U.S. nuclear forces was to deter the use of nuclear weapons against itself, its allies or its partners and also gave "assurance" that the United States would not use nuclear weapons against non-nuclear weapons states "that are party to the NPT and in compliance with their non-proliferation obligations." Yet in its nuclear employment policy, the United States has sought strategic nuclear primacy through warfighting and damage-limitation strategies that rely on counterforce capabilities, i.e., those with sufficient payloads and accuracy to strike the adversary's nuclear weapons.²⁷ This approach defies the logic of mutual vulnerability that underpins deterrence²⁸ and the normative logic of reducing nuclear weapons while pursuing their elimination.

Robust American counterforce capabilities may be needed to ensure the credibility of extended deterrence (the ability of a nuclear power to deter an attack on its non-nuclear allies)²⁹ while the United States has actively dissuaded several allies that have demonstrated interest in acquiring nuclear weapons or threshold capability, including Germany, Taiwan, South Korea, and Japan. The United States has employed both inducements and coercion to limit the spread of nuclear weapons to allies.³⁰ Security guarantees can serve as the basis for coercive leverage to ensure allies forego their nuclear aspirations. Many allies are recipients of U.S. security guarantees including the “nuclear umbrella,” and in NATO there are “nuclear-sharing” arrangements, through which non-nuclear states (such as Germany, Italy and Turkey) maintain a capability to use their attack aircraft in a nuclear role, employing American nuclear warheads stored in Europe. This arrangement, while problematic for nonproliferation, may offer other strategic advantages. It should bolster the reassurance of allies against fears of abandonment, mitigate alliance entrapment problems for the United States, and also reduce the dangers of catalytic nuclear postures in which a nuclear state—such as Israel, South Africa, or Pakistan—might threaten to use nuclear weapons to draw the United States into a conflict in which it does not want to be involved.³¹

The United States is not the only nuclear weapons state that has sought to limit the spread of nuclear weapons while simultaneously advancing other strategic objectives that may lead to the opposite outcome. In some cases, such competing objectives have led states or subnational actors to provide sensitive nuclear assistance, as France did to Israel to advance Paris’ goal of constraining Egypt, and the Khan network did in multiple instances with the apparent connivance of Pakistani authorities, in part to complicate and burden U.S. strategic behavior.³² One of the principal resulting problems is that even small nuclear arsenals in the hands of states or nonstate actors could threaten U.S. security and interests by bolstering beliefs that nuclear weapons would make aggressive moves less risky. America’s ability to coerce weaker actors could also be impaired. Some observers have suggested that this was one reason the United States could invade Iraq, but not North Korea, and that Iran appreciated the difference.³³

V. Counterproliferation

Because nonproliferation relies on a cooperative framework where the underlying assumption is that the parties will opt to forgo nuclear weapons, other

mechanisms have been needed to cope with actors that nonetheless pursue nuclear capabilities. States may opt out or withdraw from the NPT, while sub-state or transnational actors like terrorists are not a party to such agreements. Counterproliferation attempts to combat the spread of unconventional weapons through the active process of combating efforts to acquire WMD, with nuclear weapons at the top of the list.

As the debate over how to respond to a potential Iranian nuclear capability demonstrates, the threat to use force preventively to destroy or degrade a developing nuclear program remains an important policy instrument for counterproliferation, although as shown in the cases of the North Korean and Chinese nuclear weapons programs, political leaders have been reluctant to resort to preventive strikes given the likely costs and unintended consequences. Besides the use of force, the counterproliferation toolbox includes coercive diplomacy and dissuasion as well as economic pressure, including sanctions to raise the costs to states that may want to get the bomb. American leadership and global power are central to the development and implementation of counterproliferation initiatives in partnership with other governments and international organizations.

The concept of counterproliferation to prevent nuclear weapons and materials from falling into the wrong hands gained traction in the early 1990s with the collapse of the Soviet Union.³⁴ The Soviet Union had maintained nuclear arsenals in many of the former Soviet republics, such as Ukraine and Belarus and these countries had an extensive nuclear architecture. Although the newly independent states would ultimately accede to the NPT, there were concerns about unsecured nuclear materials and warheads. The possibility that terrorists, rogue regimes or subnational actors would acquire those materials or gain control over “loose” nuclear weapons motivated an active stance towards preventing such outcomes.³⁵ Recognizing the need for American assistance to mitigate the threats, senior American policymakers quickly undertook important initiatives, starting with the Nunn-Lugar Act (1991), which created the Cooperative Threat Reduction (CTR) Program that became embedded within the Defense Threat Reduction Agency (DTRA). Four objectives were specified: (1) to dismantle WMD in the former USSR; (2) consolidate and secure remaining WMD and related technology and materials; (3) increase transparency and encourage higher standards of conduct; and (4) support defense cooperation with the objective of preventing proliferation. According to DTRA, the program has deactivated more than 7,500 nuclear warheads, neutralized chemical weapons, safeguarded fissile materials, con-

verted weapons facilities for peaceful use, among other initiatives, and was subsequently expanded outside the former Soviet Union.³⁶ A new bilateral cooperative framework was signed with Russia in 2013 to supercede the CTR, but implementation was halted by the Russian government in 2015 in protest over Western sanctions and renewed conflictual relations associated with the war in Ukraine.

Nuclear smuggling below the state level has been rare, but it represents a serious challenge that could grow because of the global market in dual-use technologies and demand from both states and non-state actors. The largest known case of nuclear smuggling involved the A.Q. Khan network, which supplied weapon designs, centrifuges, and other materials to rogue states like Libya and North Korea.³⁷ A.Q. Khan was considered the father of Pakistan's nuclear program. After Pakistan acquired nuclear weapons, Khan repurposed the network for smuggling nuclear technologies. It took a number of years to identify the activity and dismantle the network. Khan was placed under house arrest in Pakistan until 2009 when he was released, despite strong protests from the United States.

Although the total quantity of unsecured nuclear sources is unclear, the IAEA identified 1,080 cases of illicit trafficking and other unauthorized use of nuclear and radiological materials from 1993 through 2006.³⁸ Although the IAEA discontinued public updates of highly enriched uranium and plutonium thefts and other incidents in 2008, they have continued to an unknown degree. Georgian authorities confirmed seizing nuclear material in 2010 from smugglers entering Georgia from Armenia. In 2011, Moldovan authorities arrested smugglers possessing 4.4 grams of weapon-grade highly enriched uranium taken from a larger ring that reportedly possesses one kilogram of uranium.³⁹ To date, the only known instances of nuclear material used in terrorist bombs occurred in connection with Chechen separatists, though these devices were never detonated.⁴⁰

Following the creation of the CTR, the U.S. promoted several additional international and national counterproliferation initiatives, including the Proliferation Security Initiative (PSI), which involves a group of countries taking active steps to prohibit the sale of dual-use materials and invest in nuclear detection capabilities. Both counterproliferation and deterrence may also be strengthened through progress in the evolving science of nuclear forensics. The United States and partner countries are constructing a database of nuclear signatures to trace the origins of nuclear materials in the event smuggled materials are seized or a nuclear explosion occurs. Multiple branches and agencies

of the U.S. government, located mainly in the Departments of Defense and Energy, are involved in counterproliferation initiatives focused on combatting the spread of WMD and defensive measures to ensure nuclear security against a variety of threats including the worst case of a nuclear attack.

VI. Concluding Policy Issues

To return to the opening scenario, is the United States prepared to deal with the threat of nuclear terrorism if nonproliferation and counterproliferation policies fail? What would happen if terrorists or a subnational group clandestinely detonated a nuclear weapon in a major American city? During the Cold War, plans for civil defense against attack by thousands of thermonuclear warheads were unrealistic. However, in addition to federal policies for homeland defense, such as improved screening for nuclear materials and weapons concealed in commercial shipping containers and similar delivery modes, civil defense measures against a small-scale terrorist nuclear or other WMD attack would be prudent.⁴¹ National and local authorities (including New York City's counterterrorism officials) are reluctant to promote civil defense education partly to avoid frightening people after 9/11. Such dodging, however, seems misguided in major American cities, such as New York, Washington, and Los Angeles, given how routinely and efficiently other disaster preparation information is disseminated, for example about hurricanes and the spread of Ebola or deadly flu viruses. Japan engages in extensive public education and preparedness for earthquakes, and indisputably its approach saves lives.

Information and basic disaster preparation is especially relevant in the case of a nuclear attack because what the shocked and injured survivors of a nuclear explosion do in the first 48 hours after a detonation will determine whether they live or die. Just as informed people watching the ocean water recede right before a tsunami hits know to run immediately to high ground, city dwellers need to react rapidly and instinctively to shelter themselves from the initial radioactive fallout. Radioactive particles begin to deposit in the first fifteen minutes after a nuclear detonation, and fallout spreads in a localized area over the next twenty-four to forty-eight hours. Depending on prevailing weather and wind patterns, the fallout plume from a ten kiloton improvised nuclear device will likely extend a few tens of miles downwind in a relatively narrow, cigar shape with a width of a few miles. With telecommunications out or unreliable in affected and nearby zones, individuals must know ahead of time what they should do and in what order.

For instance, it makes sense to get out of the path of an approaching mushroom cloud and smoke by heading perpendicular to the plume. Underground shelters offer an appropriate place to shelter from deadly gamma rays, for example in a basement behind thick walls. Schools, businesses, and apartment buildings could resurrect the practice of identifying designated shelters. Wind patterns also impact the spread of lethal radiation (in the Northeast the wind usually blows west to east) putting city dwellers at greater risk of contamination if they head out in the open in the wrong direction. Such civil defense awareness facts, like fire drills, can save lives, and in times of austerity are cost effective.

Reflecting the stark reality of the nuclear threat, President Obama in his 2009 Prague speech declared that nuclear terrorism “is the most immediate and extreme threat to global security.” To counter this threat, the President urged that “we act with purpose and without delay.” He unveiled a new international effort to secure vulnerable nuclear materials around the world, which Washington inaugurated with a Global Summit on Nuclear Security in 2010. This first Nuclear Security Summit was followed by others in 2012 and 2014. America’s global cities could join this effort by undertaking prudent and affordable civil defense measures against the WMD threat.

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NOTES

¹The sections of this chapter on a nuclear terrorist incident first appeared in Cynthia Roberts and Andrew Sherlock, "The Day After," available at <http://cynthiaaroberts.com>. Based on daytime population estimates, if terrorists detonate a 10 kiloton weapon, our model estimates the effects of the blast, shock wave, and prompt nuclear radiation would kill approximately 560,000 people or about 85 percent of those within a radius of 1.3 kilometers, (about 16 city blocks). The subsequent thermal radiation and effects from accumulated fallout could be expected to kill another 500,000 people, about half of the survivors within a 2 kilometer radius (roughly 25 city blocks). Samuel Glasstone and Philip J. Dolan, eds. *The Effects of Nuclear Weapons*. Washington, DC: U.S. Department of Defense and the U.S. Department of Energy, 1977. See also Ashton B. Carter, Michael M. May, and William J. Perry, *The Day After: Action in the 24 Hours Following a Nuclear Blast in an American City*. Cambridge, Mass.: Preventive Defense Project, Harvard and Stanford Universities, May 2007.

²Since the 1990s, "rogue states" have been considered by many U.S. officials as those that flout international law and threaten international peace and security. After 9/11, the Bush administration conflated the threat from terrorists and rogue states or "outlaw regimes that seek and possess nuclear, chemical, and biological weapons." By contrast, despite not signing the NPT, India was recognized in 2005 as a "responsible" nuclear weapons state.

³Some scholars emphasize the low probability and argue the risks are exaggerated. See for example, John Mueller and Mark G. Stewart, "The Terrorism Delusion: America's Overwrought Response to September 11," *International Security* 37:1 (Summer 2012), 81–110; and John Mueller, *Atomic Obsession: Nuclear Alarmism from Hiroshima to Al-Qaeda*. Oxford University Press, 2009.

⁴Graham Allison, *Nuclear Terrorism: The Ultimate Preventable Catastrophe*. New York: Henry Holt, 2004; Henry D. Sokoski, and Bruno Tertrais, eds. *Nuclear Weapons Security Crises: What Does History Teach?*. Washington, D.C., Strategic Studies Institute and U.S. Army War College Press, 2013; Scott D. Sagan, *The Limits of Safety: Organizations, Accidents, and Nuclear Weapons*. Princeton, NJ:

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⁵Sokolski and Tertrais, *Nuclear Weapons Security Crises*, 7–12. In the last decade, there were more than a dozen terrorist plots against New York City, and documents found in Abbottabad show that Bin Laden never abandoned his goal of attacking New York again and other U.S. cities. Multiple sources also attest to al Qaeda's nuclear ambitions. See for example, David Albright, Kathryn Beuhler, and Holly Higgins, "Bin Laden and the Bomb," *Bulletin of the Atomic Scientists* 58 (January/February 2002) and Yossef Bodansky, *Bin Laden: The Man Who Declared War on America*. Prima Lifestyles, 2011, p. 368. No one knows for sure, but some experts after 9/11 estimated the chances of a deliberate terrorist nuclear explosion in an American metropolis to be between 29 and 50 percent. Allison, *Nuclear Terrorism*. See also Richard L. Garwin, "Nuclear or Biological Megaterrorism," 27th Session of the International Seminars on Planetary Emergencies, August 21, 2002; Homeland Security Council. "National Planning Scenarios: Created for Use in National, Federal, State, and Local Homeland Security Preparedness Activities." ver. 20.1. April 2005; "The U.S.-Russia Joint Threat Assessment on Nuclear Terrorism," *Belfer Center for Science and International Affairs and Institute for U.S. and Canadian studies*, (2010); Stuart Casey-Maslen, "Armed non-state actors and 'nuclear terrorism,'" in Gro Nystuen, et al., eds. *Nuclear Weapons Under International Law*. Cambridge University Press, 2014; Carson Mark, et al., "Can Terrorists Build Nuclear Weapons? *International Task Force on the Prevention of Nuclear Terrorism—Nuclear Control Institute*, Washington D.C 1996; and Peter D. Zimmerman and Jeffrey G. Lewis, "The Bomb in the Backyard," *Foreign Policy*, 16 October 2009, 5–9.

⁶Matthew Bunn and Anthony Wier, *Securing the Bomb: An Agenda for Action*. Harvard University, Project on Managing the Atom, May 2004; Richard L. Garwin and Georges Charpak, *Megawatts and Megatons: A Turning Point in the Nuclear Age?* New York: Alfred A. Knopf, 2001; Leonard Spector with Jacqueline Smith, *Nuclear Ambitions: The Spread of Nuclear Weapons 1989–1990*. Boulder, Colo.: Westview Press, 1990; and Chaim Braun and Christopher F. Chyba, "Proliferation Rings: New Challenges to the Nuclear Nonproliferation Regime," *International Security* 29 (Fall 2004). For the argument that states are unlikely to share nuclear weapons, see Keir A. Lieber and Daryl G. Press, "Why States Won't Give Nuclear Weapons to Terrorists," *International Security* 38:1 (Summer 2013), 80–104.

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⁸Department of Defense Strategy for Countering Weapons of Mass Destruction (June 2014).

⁹Peter R. Lavoy, "The Enduring Effects of Atoms for Peace," *Arms Control Today*, 2003.

¹⁰Treaty on the Non-Proliferation of Nuclear Weapons available online at www.state.gov/www/global/arms/treaties/npt1.html. India, Israel, and Pakistan never joined the NPT. North Korea announced its withdrawal from the NPT in January 2003. The Statute of the IAEA may be accessed here: <https://www.iaea.org/about/statute>

¹¹Lavoy, "Atoms for Peace."

¹²Matthew Fuhrmann., "Spreading Temptation: Proliferation and Peaceful Nuclear Cooperation Agreements," *International Security* 34:1 (Summer 2009):17–41.

¹³Peter R. Lavoy, *Learning to Live with the Bomb: India, the United States, and the Myths of Nuclear Security*. Palgrave Macmillan, 2004.

¹⁴Richard K. Betts, "Universal Deterrence or Conceptual Collapse? Liberal Pessimism and Utopian Realism," in Victor A. Utgoff, ed., *The Coming Crisis: Nuclear Proliferation, U.S. Interests and World Order*, Cambridge, MA: MIT Press, 2000, pp. 51–85; Richard K. Betts, "The New Threat of Mass Destruction," *Foreign Affairs*, 77:1 (January/February 1998), 26–41; and Ashton B. Carter

and William J. Perry, *Preventive Defense: A New Security Strategy for America*, Brookings Institution Press, 1999.

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⁴¹There are no known instances of nuclear terrorism to date or specific reports of attempted radiological attacks since 2000. The first two radiological incidents, in 1995 and 1998, involved Chechen separatists and Cesium-137 materials that targeted Gorky Park in Moscow and a railroad east of Grozny, respectively. The 2000 incident involved a bomb at Russian nuclear facility, but the Russians reported that there was no ongoing nuclear activity at the facility. The Pakistan Taliban has also targeted that country's nuclear facilities. *Ibid*.

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