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Atomic Bonds in an Age of Entropy

The Pursuit of a Nuclear Security Framework in the Middle East

FEBRUARY 28, 2018 — BILAL Y. SAAB AND NILSU GOREN

Disorder and violence in the Middle East have reached unprecedented levels that make any talk of regional security cooperation, let alone plans for it, seem less credible today than ever before. Indeed, it is hard to imagine how arms control agendas could be launched in the region at a time when four countries—Iraq, Libya, Syria, and Yemen—are engulfed in civil war, the Saudi-Iranian regional power struggle is worsening, and violent extremist groups are sowing death and destruction across the region and beyond.

Yet it is precisely under such extremely challenging conditions that security cooperation is most needed. And because most of the security problems affecting Middle Eastern stability are regional in nature, they require regional solutions. One of the ways to break this impasse and instill some degree of trust and confidence among regional stakeholders is by proposing practical, gradual items of cooperation that avoid politics and controversy, and do not intrinsically and immediately infringe upon the sovereignty and national security of states in the region. One such issue that could encourage countries in the Middle East to act more collectively and achieve concrete, mutual benefits is radiological and nuclear security. Though most countries in the Middle East do not possess highly-enriched uranium or plutonium—materials necessary to build nuclear weapons—given the region's intense volatility the threats associated with radioactive materials are present and real.

Enhancing nuclear security and ensuring that radiological and nuclear materials and weapons do not fall into the hands of rogue actors and terrorists are not only hugely valuable ends in themselves, but also could serve as confidence- and security-building measures in a region that lacks both security and confidence. In particular, establishing a regional code of conduct on securing radiological and nuclear materials is a meaningful and more achievable goal than other pursuits tied to traditional or hard defense and security matters.

This report first assesses the regional challenges to nuclear and radiological security within the Middle East—namely the expansion of civilian nuclear power, the nature of radioactive material, the lack of a security culture in the region, and most prominently the threat of chemical, biological, radiological, and nuclear (CBRN) terrorism. It then provides an overview of the existing successful mechanisms that regional states have developed to enhance cooperation against radiological and nuclear threats. It concludes by proposing a regional framework on security in response to such threats, one that would not only build on existing international mechanisms against these threats but also recognize and address the specific needs of the Middle East and its challenging strategic realities.

Order from Ashes

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Challenges to Nuclear and Radiological Security

Major disruptions in the geostrategic balance in the Middle East drastically affect global oil prices, as the decrease of petroleum exports from Libya demonstrates.[1] Factors contributing to concerns over the sustainability of energy supply include the impact of environmental issues such as climate change, high reliance on fossil fuels, the globalization of energy demand, cyber-vulnerability of critical infrastructures, and the security of energy supplies in the Persian Gulf, where 60 percent of the world's conventional oil reserves are located.[2]

Several governments in the region see nuclear energy as a long-term solution to fossil-fuel dependence. Increased energy demand and the economics of nuclear power are the main drivers behind this heightened interest in nuclear energy. Another factor is climate change mitigation—states are likely to expand nuclear power generation to ensure sufficient energy production while reducing emissions. And Middle Eastern countries have stated an interest in using nuclear energy to power desalinization. From 1971 to 2014, energy use in the Middle East and North Africa grew 502 percent, and the trend continues apace today.[3] In the six countries of the Gulf Cooperation Council (GCC), energy consumption outpaces the growth of both gross domestic product and population, and such countries are expected to need 40 percent more electricity over the next five years to meet the demand.[4] Emerging nuclear power countries include Egypt, Iran, Jordan, Kuwait, Qatar, Saudi Arabia, Turkey, the United Arab Emirates, and Yemen. Even though these countries vary in how far their nuclear plans and infrastructure are developed, the region will likely establish several new plants in the next few decades. The Emirates' first nuclear power plant, the Barakah, has finished construction and will begin operating in 2018.[5] In Turkey, the construction of the Akkuyu power plant, to be built, owned, and operated by Russia's Rosatom, is ongoing despite political hiccups. Jordan also signed a deal with Rosatom to build the country's first nuclear power plant by 2023.[6] Egypt's deal with Rosatom plans to build four nuclear reactors in the next twelve years.[7] Saudi Arabia, meanwhile, has an ambitious plan to build sixteen reactors by 2040.[8]

Yet this expansion of nuclear power generation, heralded as a renaissance by its backers, could exacerbate the risk of nuclear proliferation. The distinction between civilian and military nuclear technology, and between nuclear energy generation and nuclear weapons development, depends solely on the production and processing of weapons-grade materials. Hence, nuclear power plant designs need to be proliferation-resistant. Nuclear newcomers need to reassure their neighbors and the world at large of the peaceful nature of their nuclear energy programs through International

Atomic Energy Agency (IAEA) inspections. The geographic proximity of reactors will also generate security concerns, as demonstrated by Jordan's recent relocation of its planned first nuclear power plant from Aqaba to Azraq, east of Amman —since Aqaba is in an active seismic zone, which Israel had raised as a concern.

The first line of defense against proliferation comprises the safety, safeguards, and security measures that are incorporated into the initial reactor design through the "design basis threat" assessment. The features of this assessment —which is both a military concept and a fundamental principle of physical protection defined by the IAEA—need to be rigorously and continuously tested against realistic and challenging scenarios.

On the nuclear safety front, both nuclear and climate risks impose planetary-scale existential threats and require global response.[9] The 2011 earthquake and tsunami and the Fukushima Daiichi disaster in Japan showed the world that major seismic events can disable reactor cooling systems and cause nuclear meltdown and contamination. Because the Middle East lacks cooling water and has seismic activity, any accident at a nuclear power plant would result in cross-border contamination. Emergency preparedness and response should be a shared responsibility between regional states. This is a pressing concern that inherently cuts across political boundaries.

Another concern is that, given the increased demand for nuclear energy in the Middle East, incidents of radioactive material theft also are likely to increase. Around the globe, such incidents are already startlingly common. According to the IAEA, from 1993 to 2015 there were 2,889 confirmed incidents of "illicit trafficking, thefts, losses," or "other unauthorized activities and events involving nuclear and other radioactive material" worldwide, 762 of which involved theft or loss.[10] To ensure physical protection, on-site security as well as comprehensive plans for the transportation and storage of spent fuel and radioactive waste need to be developed to protect against unauthorized access, theft, and sabotage. All personnel involved in the nuclear programs need to be carefully vetted, selected, and trained. In addition, continuous background checks and constant surveillance are required against insider threats. Such security measures will also require cross-border coordination among regional states.

Overall, the infrastructural, regulatory, financial, and political aspects of these nuclear programs need to be analyzed independently—beyond energy needs and financial solutions—to assess how ready each country is to maintain safe, secure, and proliferation-resistant nuclear power plants. The motivation to lower sunk costs gives technology-providing countries such as Russia an incentive to potentially sacrifice safety and security. In countries where the financing of the nuclear energy program is a concern, the hosts may depend on the technology suppliers and prioritize cost concerns. Indeed, most governments in the region that adopt nuclear energy programs do so based on economic analyses and focus on financing, as seen in the "build-own-operate" model that Turkey is seeking from Russia. Nonmonetary elements,

such as regulations for radioactive waste management, are treated as afterthoughts that can be taken care of as the construction of the nuclear power plant progresses. All these patterns will need to change based on regional safety and security considerations.

Regional governments must establish independent regulatory frameworks and draft national legislation and regulations to account for and control nuclear materials, along with criminal penalties for law enforcement. Without political autonomy—which is likely to be an issue in the Middle East—the regulator would lack accountability and transparency. Countries in the region also need to develop national plans for human resources development and trained personnel to support these emerging nuclear energy programs in order to try to overcome the "regulator-operator information asymmetry"—that is, the gap between the experience and capacity levels of the host country on the one hand and the technology provider on the other. This asymmetry inhibits host oversight.[11]

A WORKER IN PROTECTIVE CLOTHING UNLOADS A DUMMY GRENADE AT THE GERMAN GEKA FACILITY, WHICH ASSISTED WITH THE DISPOSAL PART OF SYRIA'S CHEMICAL WEAPON ARSENAL. SOURCE: NIGEL TREBLIN/GETTY IMAGES.

Securing Radioactive Material

The Middle East has several thousand sealed sources of radioactivity, which are used in medical diagnostics, academic research, and commercial activity, including pharmaceutical companies, food irradiation facilities, radioisotope manufacturers, and laboratories. Given the limited quantity of and high security around nuclear materials, most cases of

illicit trafficking involve highly radioactive materials, which are more vulnerable to theft. Unlike military nuclear materials, these radioactive materials are more likely to be out of regulatory control and unsecured, and could evade border control measures.

According to the 2016 Nuclear Security Index, the Middle East and North Africa region ranks poorly in safeguarding nuclear materials from theft and vulnerability to nuclear sabotage.[12] Among the 152 countries that do not possess weapons-usable nuclear materials, Middle Eastern countries rank poorly for their security and control measures, domestic commitments, and capacity against theft of radiological materials. From worst to best, the rankings are as follows: Syria (151), Yemen (126), Egypt (126), Oman (106), Iraq (103), and Libya (95). The sabotage rankings, which include forty-five countries and are based on the risk environment, security measures, and domestic capacity, point to the most unfavorable nuclear security conditions in Iran (44), Egypt (43), Algeria (42), Morocco (40), and Israel (36).

Another issue is the dual-use nature of these materials. Clearly, states have sovereign rights to use radioactive materials for peaceful purposes. But since all radioactive sources emit energy, there is no undefeatable technical solution to distinguish between harmless and harmful sources without additional security measures. Even run-of-the-mill items like smoke detectors, fertilizers, cat litter, and food such as bananas typically produce false alarms. However, modern-day radiation detection instruments can differentiate between real and innocent alarms, the latter of which might be set off by, for example, a patient who has received radionuclide treatment, or naturally occurring radioactivity.

Radiological materials for peaceful purposes are ubiquitous in research, industry, medicine, and commercial facilities, which are mostly unsecured. cesium-137 and cobalt-60 are commonly used for treating cancer with radiation therapy. Terrorists could steal these radioactive sources from hospitals or obtain them through illegal contacts from other facilities. Such scenarios point to the dangers of both unauthorized access and insider threats, common problems that could pose a serious concern to civilian sources.

Despite the existence of mechanisms for enhancing the physical protection and security of nuclear materials, a comprehensive international regime that addresses radioactive threats has not yet materialized. The legal architecture for radioactive materials is weak and there is no universal implementation of the IAEA Code of Conduct on the Safety and Security of Radioactive Sources (IAEA/CODEOC/2004), which addresses the deliberate acquisition of radioactive sources for malicious use. Without such a safeguarding regime—supported by regional arrangements that define robust, layered security mechanisms—terrorists can gain access to radioactive materials that lack accountability measures. Radiological and nuclear materials also could be stolen from storage facilities or during transportation, other points of

vulnerability in the supply chain. Within the region, the introduction of new operators without nuclear experience also could be a recipe for disaster. Most militaries in the region have CBRN units, but they are not involved in protecting civilian nuclear reactors, where private security companies generally provide on-site security.

All of the issues surrounding the security of nuclear materials point to the need for a coordinated effort that reaches across international borders to improve existing systems and oversight mechanisms in the Middle East.

ARMS INSPECTORS FROM THE UN MONITORING, VERIFICATION AND INSPECTION COMMISSION (UNMOVIC) SEARCH FOR WEAPONS INSIDE A MILITARY INDUSTRIAL COMPLEX AT AL-TARIQ GENERAL COMPANY, DECEMBER 9, 2002, NORTHWEST OF BAGHDAD, IRAQ. SOURCE: GETTY IMAGES.

The CBRN Terrorism Threat

The threat of nuclear and radiological terrorism is constantly evolving. Although the Islamic State and its global network is currently the top terrorist threat, it is not the only threat. Al-Qaeda and its affiliates are still very much active and are present in Syria, Iraq, Yemen, and elsewhere. In November 2015, ten grams of iridium, a radioactive isotope, were stolen in Basra, Iraq.[13] Although the material was very small in quantity and eventually was found abandoned, its theft heightened fears that the Islamic State might pursue such material to build a radiological dispersal device, commonly known as a dirty bomb. Despite its small size, the material could have caused radiation sickness and injured people in direct contact.

Concern about terrorism is not limited to fissile and radiological materials. In the broader context, there is a vast literature on the need for oversight and regulation of CBRN agents, and for adopting policies and practices to minimize the risk of their acquisition by terrorists all over the world, especially radical fundamentalists, right-wing extremists, and

apocalyptic millenarian groups with destructive ideologies. The Middle East's unprecedented instability, ongoing conflicts, and proliferation of terrorist groups make the development of a robust mechanism to address such concerns a particularly pressing issue for the region. Weapons of mass destruction have entered terrorists' imagination, though fortunately not yet their kinetic repertoires.[14] Religious terrorists are the most likely of potential violent nonstate perpetrators to use weapons of mass destruction, owing to the apocalyptic nature of their philosophy and rhetoric.[15] Radiological weapons are not necessarily weapons of mass destruction, but they could be used as weapons of mass disruption.

Many experts argue, citing the historical cases of failure, that violent nonstate actors lack the command, control, and sophistication to access, weaponize, and deploy CBRN agents. However, a risk remains, especially considering the role of illicit trafficking in state and nonstate capabilities. Even though it is not easy to weaponize these materials, terrorists could attempt to do so by drawing on the expertise of former government scientists. Proliferation rings, such as the smuggling network of Pakistani nuclear physicist A. Q. Khan that was revealed in 2004, also exacerbate the challenge of stopping the spread of CBRN agents and illustrate the inadequacy of export controls.[16] In so-called first-tier proliferation, technologies or materials are sold or stolen from private companies or state nuclear programs that assist nonnuclear weapon states to develop illegal nuclear weapons and delivery systems. Proliferation rings are examples of second-tier proliferation, which is a strong challenge to the supply-side approach to the nonproliferation regime, as states in the developing world can trade among themselves to bolster their nuclear weapon capabilities with varying levels of technology.[17]

In terms of impact, the biggest threat arises from improvised nuclear devices manufactured by stealing or diverting fissile material.[18] The amount of fissile material required for a bomb of this sort—for example, a dirty bomb—would be small. Further, the possibility of access to these materials would be enormous, since fissile materials are ubiquitous in nuclear weapon states, such as in inadequately safeguarded research reactors fueled by highly enriched uranium. A dirty bomb would scatter radioactive material using a conventional explosion and would lead to "area denial"—making a facility or part of a city inaccessible for an extended period because of radiological contamination. In the Middle East, dirty bombs could be deployed using existing common methods, such as car bombs in urban areas. Depending on the dose of radiation, a bomb could also kill with lethal radiation. Its psychological impact would be much more extensive: such an explosion would lead to panic, fear, and mistrust in the government. Consequently, it is unsurprising that many terrorist organizations seek the materials to make a dirty bomb. Although the manufacturing and successful detonation of a nuclear explosive device would require access to fissile material, extensive know-how, and facilities, the actual radioactive materials needed to assemble a dirty bomb would be relatively easier to obtain.

Preventing a catastrophic terrorist attack necessitates containing the means of attack more than containing the terrorists themselves, who will always have new targets and tactics and who may be difficult to identify. Long-term viability of safeguards on nuclear and radiological materials will require a first line of defense against theft through cooperative threat reduction efforts, strengthened export control regimes and controls on first-tier suppliers, limitations on the production of highly enriched uranium and separated plutonium under multilateral control, and consideration of multinational approaches to spent fuel and radioactive waste disposal.[19] Yet such an ideal global managerial control of mass destructive agents has several limits: there is no baseline global inventory except intelligence estimates, no comprehensive regulatory framework to push states for global monitoring, and no global norm to provide accurate data to such an effort. In the immediate future, states in volatile regions such as the Middle East need to assess, through rigorous analyses, the risk of radiological materials in the hands of substate or hybrid actors such as the Islamic State, with an eye toward creating a regional preparedness framework.

Radiological and Nuclear Threats: Cases of Regional Cooperation

The Middle East region has no institutional or organizational mechanism to discuss issues surrounding weapons of mass destruction or any other regional security concern. However, an existing regional mechanism could be utilized for cooperation against CBRN threats. The CBRN Centers of Excellence (CoE) network, an initiative funded by the European Commission and the United Nations Interregional Crime and Justice Research Institute, has two regional secretariats in the Middle East: one in Amman that serves the whole region and one in Abu Dhabi that specifically serves the GCC countries. The CoE network supports the development and implementation of CBRN risk mitigation strategies. Partner countries include the Emirates, Iraq, Jordan, Lebanon, Qatar, and Saudi Arabia. These countries appoint national teams that report to the regional centers, which are designed to address the gaps in technical capacity, equipment, and training, utilizing international resources.[20]

In September 2012, the center of excellence in Amman became the first operational regional secretariat at the Middle East Scientific Institute for Security (MESIS).[21] MESIS has been regularly hosting seminars to promote regional cooperation to enhance a nuclear security culture. One of the most unusual aspects of MESIS has been its ability to overcome the Western-centric narrative on nuclear security by bringing in regional and local perspectives and holding events in the region.[22]

The FALCON exercise in February 2016 in Abu Dhabi was the first inter-Arab nuclear detection and response exercise. It aimed at promoting regional approaches and encouraging information sharing related to the detection and initial response to radiological and nuclear threats. The exercise was a CoE initiative and developed in partnership with the

Emirates, Jordan, and Morocco. During the three-day workshop and tabletop exercise featuring a nuclear simulation drill, more than two hundred participants from the Arab states of the Gulf, Jordan, Morocco, and international organizations such as the European Commission and the Global Initiative to Combat Nuclear Terrorism discussed the establishment of an inter-Arab network and formed national teams aimed at building capacity in radiological and nuclear threat mitigation, detection, forensics, and initial response.[23] This network would strengthen regional cooperation in nuclear forensics among regional experts. The IAEA and the World Customs Organization attended the exercise as observers, while Finland and Australia, the Nuclear Detection and Nuclear Forensics Working Group chairs, and the Netherlands, the Implementation and Assessment Group coordinator, attended as subject matter experts.[24]

One coordination project that followed the FALCON exercise is "Strengthening Responses to Nuclear Security Events in the Gulf Cooperation Council Countries," with the sponsorship of CoE partner countries—the Emirates and Saudi Arabia—and the participation of Bahrain, Jordan, Kuwait, Morocco, and Oman.[25] The project seeks to build expertise in localization of radioactive or nuclear material, categorization, development of national nuclear response plans, methods for collecting and processing contaminated evidence, acquisition of equipment, and training. The emphasis is on enhancing national and regional interagency coordination and cooperation.

Another example of successful regional cooperation is the program established at Khalifa University in the Emirates to provide technical capabilities for the adjudication of radiation alarms at Khalifa Port and other radiation portal monitors.[26] As part of the project, radiation detection personnel will request "reachback"—a process in which they contact nuclear and engineering scientists for assistance when they detect unusual radionuclides, such as radioactive isotopes, or malicious material, such as highly enriched uranium or plutonium. Khalifa University will train a multiorganizational team of experts in radiation detection and have a minimum of two on-call reachback scientists available at all times. The team at the port will be able to contact the mobile expert support team in case of a confirmed detection of an illicit source. This approach contributes to enhancing regional human capital through the collaboration of academia, governmental organizations, and industry.

Encouragingly, Middle Eastern countries recently have become more involved in global discussions about nuclear security, notably through participation in the Nuclear Security Summits, the first of which U.S. president Barack Obama convened in 2010. The summits were designed to promote cooperation among participating states at the level of heads of state, and to prevent illicit trafficking of nuclear materials and their acquisition by terrorist groups. The summits also underlined the need to strengthen physical protection and measures against illicit trafficking of radiological materials, and encouraged international cooperation aimed at preventing radiological terrorism.

From 2010 to 2016, various countries in the Middle East participated in the four nuclear security summits. These countries included Egypt, the Emirates, Israel, Jordan, Saudi Arabia, and Turkey. These regional states have expressed their commitment to adopting measures to minimize the threat of nonstate actors acquiring nuclear and radioactive materials. In particular, at the 2012 Seoul summit Jordan introduced the counter-nuclear-smuggling "gift basket"—a set of commitments that states present as gifts to overcome the weak language in consensus documents. Fourteen countries pledged to make resources and lessons available for capacity-building.

Created in September 2013, the counter-nuclear-smuggling team is led by the Jordanian Armed Forces. Other related Nuclear Security Summit gift basket items coordinated by Jordan include the Joint Statement on Sustaining Action to Strengthen Global Nuclear Security, Insider Threat Mitigation, Supporting Nuclear and Radiological Terrorism Preparedness and Response Capabilities, Joint Statement on Promoting Full and Universal Implementation of UN [United Nations] Security Council Resolution 1540, and Nuclear Security Training and Support Centres/Centres of Excellence (NSSC/CoE).[27] All these gift baskets represent important strides in coordination efforts from within the region; behind the bland technical language is an acknowledgment that responding to nuclear challenges requires new levels of cooperation between states, and efforts that recognize the political realities and security challenges unique to the Middle East.

As the Nuclear Security Summits concluded in 2016, their final action plans identified Interpol's Radiological and Nuclear Terrorism Prevention Unit as the leading authority on radiological and nuclear terrorism. Regional delegations need to cooperate with Interpol, the Global Initiative to Combat Nuclear Terrorism, and the newly established Nuclear Security Contact Group to follow up on the regional states' summit commitments. These steps ensure that the work of the summits will not be abandoned as a one-off event.

Toward a Regional Framework

In recent years, two major institutional proposals have been made for cooperative security in the Middle East. The first is a conference to initiate a process that would create a zone in the Middle East that would be free of weapons of mass destruction. The second is a coordinated effort to create a new Gulf security framework that addresses all Gulf states' security concerns and builds trust between Iran and its Arab neighbors, as a first step toward a conference on security and cooperation in the Middle East.

Although a Middle East devoid of all weapons of mass destruction would clearly be an ideal solution to proliferation concerns in a volatile part of the world, positive outcomes in the region—let alone ideal ones—remain a far-off dream. Since the days of the U.S.-led Arms Control and Regional Security talks in the early 1990s, no measurable progress has been made on regional security cooperation, including the establishment of a nuclear- or weapons-of-mass-destruction-free zone. The same issues that overwhelmed arms control talks and agendas in the early 1990s—regional conflicts and political differences—persist to this day. They may look different today, and may involve different antagonists, but they still have the same debilitating impact on the arms control process. Can the diplomatic logjam on arms control in the Middle East ever be broken? It is possible, but the key is and always has been gradualism.

A zone in the Middle East in which all radiological and nuclear materials are secured would be an example of a gradual and creative approach to broader, regional arms control. All the countries of the Middle East share the need for protection against radiological and nuclear terrorism, and unlike conventional arsenals, radiological materials are not

THE REACTOR BUILDING AT THE RUSSIAN-BUILT BUSHEHR NUCLEAR POWER PLANT IN SOUTHERN IRAN. SOURCE: IIPA VIA GETTY IMAGES.

(at least officially) part of any state's national security strategy. Governing elites in the region could choose one of three options. One, they could rely on current mechanisms against radiological and nuclear threats under existing international regimes. Two, they could create an indigenous, regional security mechanism. Three, they could establish a hybrid framework. The region might need its own, tailor-made arrangements. However, the process could be mentored by the existing regimes and international organizations.

As with any cooperative measures, there are constraints on regional cooperation in this area. Not all states in the region have signed or ratified the key international instruments, including UN Security Council Resolution 1540 regarding the prevention of the proliferation of nuclear, chemical or biological weapons and their means of delivery;[28] the IAEA "Physical Protection of Nuclear Material and Nuclear Facilities" document, which complements the Convention on the Physical Protection of Nuclear Material (CPPNM);[29] the IAEA Code of Conduct; and the 2005 International Convention for the Suppression of Acts of Nuclear Terrorism, which requires state parties to criminalize and penalize nuclear terrorism, defined as the use of nuclear or radiological materials.[30] Various other international regimes, codes, and regulations address the transport security of radiological and nuclear materials, and must be considered as well. These include the UN International Maritime Organization Conventions and the IAEA Regulations for the Safe Transport of Radioactive Material.

A key element in the success of the establishment of a regional radiological and nuclear security framework would be continued dialogue through an institutionalized process. This framework would not be legally binding, but a code of conduct would recognize its standards and recommendations. The dialogue could then identify regional players who could implement measures that would allow states to identify and secure radiological and nuclear materials throughout the region. The process would also necessitate adequate information sharing between intelligence agencies and law enforcement agencies at the national and regional levels. The main challenge in the threat analysis is timely and accurate intelligence and security assessment sharing, which requires the arrangements to be depoliticized and open channels of communication to be maintained even during political crises, on an ad hoc multilateral basis.

Fortunately, the natural characteristics of radioactive materials make them suitable for detection and regulation: they are quite difficult to conceal. Their half-lives are short as well. All radioactive sources emit energy and the spectrum and intensity of the emission is unique to each element. Although heavy shielding can exponentially reduce the amount of observed radiation, no shielding can bring the emissions to zero.

At a minimum, the steps toward a regional framework would include setting up national registers of radiological and nuclear materials, identifying the gaps in national legislation and criminal codes, developing measures to detect radioactive materials, and establishing standards and sharing best practices for securing these materials' sources with a view toward regional capacity-building. International partners such as the European Union (EU) and the United States would be key players in building a region-wide, adaptive, and robust infrastructure to detect and secure the materials. These operational measures include advanced neutron and gamma detectors and network-based radiation detection systems, as well as the trained personnel to use them, and regional emergency management centers. To this end, a Middle East action plan for prevention, detection, preparedness, and response could be inspired by the EU CBRN Action Plan.

Initial next steps include encouraging states that have not yet done so to become party to the International Convention on the Suppression of Acts of Nuclear Terrorism, and commit to the IAEA's Code of Conduct. Nuclear newcomers should be encouraged to take steps to counter illicit trafficking through export control arrangements such as the Nuclear Suppliers Group on nuclear-related exports, the Zangger Committee on fissionable materials, and the Australia Group for chemical and biological export controls. These multinational export control regimes regulate the trade of dual-use goods and nuclear-related technologies that could be weaponized. Although these organizations' arrangements are not legally binding, their participating states voluntarily harmonize export controls and contribute to global nonproliferation regimes.

Conclusion

In a hyperconnected world, security challenges require less country-specific and more crosscutting measures. This is especially so in the Middle East, where borders are vast, porous, and insecure. These measures must be collaborative.

In principle, all states in the Middle East share the need to protect against radiological and nuclear terrorism. However, taking practical, gradual steps toward the common goal of preventing terrorist access to radiological and nuclear materials is possible only if states in the region prioritize finding common ground, instead of focusing on long-standing political differences. Success or failure will depend on how such arms control measures are pursued: the less intrusive they are, and the clearer their positive contributions to national security, the higher the chance that countries in the region will sign up for them. Even if arms control is pursued through a narrow prism of self-interest, a lot can be accomplished on the collective or regional level. In fact, arms control works best when it is not an end in itself, but rather is the means to an end—the end being national security.

Even so, the fact that nuclear security is a clear case where cooperation is in the rational self-interest of states is not a guarantee that cooperation will occur. The road to cooperation between states, especially in the Middle East, is never linear. Even if a win-win case of cooperation presents itself in the region, several obstacles could stand in the way, including capacity deficiencies, incompetent leadership, and (perhaps most important) domestic political considerations. In short, a leader might perceive the value in pushing for cooperation, but if he is weak at home or lacking in ability then his intentions will not be consequential. The history of mistrust among countries in the region does not help, either, as it raises the risks and, potentially, the costs for any leader's pursuit of cooperation. Indeed, an adversary may view any overture, no matter how trivial or sensible, as an attempt to gain advantage, whether in the nuclear realm or any other.

Yet this grim reality should not kill all hope for regional collaboration on radiological and nuclear security. Certain types of collaboration can be hard to imagine in the current political climate, but they are not impossible, and should still be pursued. Even incomplete or imperfect initiatives are infinitely better than a complete lack of security frameworks. Just imagine a world without the Treaty on the Non-Proliferation of Nuclear Weapons (also known as the Non-Proliferation Treaty, or NPT). The NPT is hardly a foolproof mechanism for preventing nuclear proliferation across the globe, but it is the only one, and it surely beats no mechanism at all.

As the Cold War's legacy in arms control has shown, technical cooperation can have knock-on benefits in other aspects of security. In the Middle East, where trust is in such short supply, even incremental improvements at the fringes of the major issues can make valuable contributions to the foundation of regional security and stability.

Notes

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http://www.nss2016.org/document-center-docs/2016/3/31/national-progress-report-jordan.

28. The resolution mandates that all states adopt and enforce “appropriate effective laws which prohibit any non-State [sic] actor to manufacture, acquire, possess, develop, transport, transfer or use nuclear, chemical or biological weapons and their means of delivery,” as well as prohibiting attempts to engage in such activities, assist, or finance them. See “1540 Fact Sheet,” 1540 Committee, accessed September 7, 2017, http://www.un.org/en/sc/1540/1540-fact-sheet.shtml. All Middle Eastern states submitted an initial report to the 1540 Committee and have submitted several reports ever since, but these efforts vary greatly in implementation beyond diplomatic statements. The Emirates and Jordan have legislation geared toward 1540 objectives. See “Middle East and North Africa Reporting,” NTI, accessed September 7, 2017, http://www.nti.org/analysis/reports/middle-east-and-north-africa-1540-reporting/#implementation.

29. Signed in 1980, the CPPNM covers nuclear materials used for peaceful purposes while they are being transported internationally, and is the only international legally binding agreement governing physical protection of nuclear material. See “Convention on the Physical Protection of Nuclear Materials,” IAEA, accessed September 7, 2017, https://www.iaea.org/Publications/Documents/Conventions/cppnm.html. Bahrain, the Emirates, Iraq, Jordan, Kuwait, Libya, Oman, Qatar, Saudi Arabia, and Yemen, have signed the CPPNM, and Israel and Turkey have ratified the treaty. See “Convention on the Physical Protection of Nuclear Material,” IAEA, accessed September 7, 2017, http://www.iaea.org/Publications/Documents/Conventions/cppnm_status.pdf. An amendment adopted in 2005, but not yet in full effect, extends its scope to include the domestic use, storage, and transportation of nuclear materials and the protection of nuclear materials and facilities against theft and sabotage. See “Nuclear Security – Measures to Protect Against Nuclear Terrorism,” Report by the Director General, IAEA, accessed October 2, 2017, https://www.iaea.org/About/Policy/GC/GC50/GC50Documents/English/gc50-13_en.pdf.

30. Egypt, Israel, and Syria have signed the convention; Jordan, Kuwait, Lebanon, Libya, Qatar, Saudi Arabia, and Turkey have ratified it. See the UN list of countries by status, accessed September 7, 2017, https://treaties.un.org/pages/ViewDetailsIII.aspx?src=TREATY&mtdsg_no=XVIII-15&chapter=18&Temp=mtdsg3&clang=_en.

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