EU NON-PROLIFERATION CONSORTIUM

The European network of independent non-proliferation think tanks

A Regional Arrangement on Securing Radiological Agents as a CSBM: Common Interest in Preventing Radiological Terrorism

AVIV MELAMUD AND NILSU GÖREN

BACKGROUND PAPER

Second EU Non-Proliferation Consortium Seminar to Promote Confidence Building and in Support of a Process Aimed at Establishing a Zone Free of WMD and Means of Delivery in the Middle East
Brussels, 5-6 November 2012

November 2012

Content

About the Authors

Aviv Melamud is a research associate and PhD candidate at the Peace Research Institute Frankfurt, focusing on compliance with the Treaty on the Non-Proliferation of Nuclear Weapons. Nilsu Gören is a graduate fellow at the Center for International and Security Studies (CISSM) at the University of Maryland, College Park where she is pursuing a Ph.D. with a focus on Turkish defense and non-proliferation issues.

Aviv and Nilsu are members of the Center for Non-Proliferation Studies' Middle East Next Generation Initiative, which works to build arms control, non-proliferation and disarmament capacity in the region by training the next generation of Middle East experts and engaging them in an ongoing unofficial dialogue ('Track 2') focusing on these issues (http://cns.miis.edu/programs/middle_east/120305_mideast_nextgen_initiative.htm).

The authors are indebted to Dr. Pierce Corden and Dr. Amir Mohagheghi for their valuable comments.

Abbreviations

CBRN	Chemical, Biological, Radiological, and Nuclear
CCA	UN Commission on Conventional Armaments
CD	Conference on Disarmament
CSBMs	Confidence and Security Building Measures
IAEA	International Atomic Energy Agency
IND	Improvised Nuclear Device
NPT	Treaty on the Non-Proliferation of Nuclear Weapons
RDD	Radiological Dispersal Device
WMD	Weapons of Mass Destruction

1. Introduction

Confidence and Security Building Measures (CSBMs) are intended to build trust and enhance security between parties to a political process, and can contribute to gradual conflict transformation and resolution. In this paper, we propose that designing and implementing a radiological materials-secured zone for the protection of radiological materials and the prevention of radiological terrorism on the regional level could serve as a CSBM by positively contributing to a Middle East regional arms control and security process. Since the need for protection against radiological terrorism is shared by all regional actors, and considering that radiological weapons are not likely to be included in any actor's national security strategy, the issue of radiological protection can offer a cooperative project which would not only enhance security through the prevention of radiological threats, but could also build further channels of collaboration in the region and thus increase confidence.

2. The Threat of Radiological Weapons

Radiological weapons are the fourth and sometimes overlooked type of weapons of mass destruction (WMD),[1] often forgotten behind the nuclear, chemical and biological threats. A typical radiological weapon – called Radiological Dispersal Device (RDD), or 'dirty bomb' – would trigger the scattering of radioactive material by a conventional explosion (to be distinguished from a *nuclear* explosion as occurs in nuclear weapons) or by other means, for the purpose of area denial through radiological contamination, as well as possible physical effects of this contamination on people exposed (lethal or non-lethal, depending on the dose).[2] Based on the size of the radiological weapon, the radiological fallout has the potential to make an area uninhabitable for an extended period of time. Radiological weapons are not likely to be a weaponization option for states, yet because radiological materials for peaceful purposes might not be equally safe and secure in every country, where they are used in medicine, commerce, industry and research facilities, a radiological weapon may be the WMD chosen for acts of terrorism.

Different arrangements regarding the protection of nuclear and radiological materials were developed already several decades ago, but since 9/11, concerns over nuclear and radiological terrorism have heightened and international arrangements on related issues have been correspondingly revised or newly formulated. However, despite the existence of quite a few mechanisms for enhancing the physical protection of such materials (see annex for an overview), a sufficiently comprehensive international regime that addresses radioactive

[1] The UN Commission on Conventional Armaments (CCA) WMD definition from 12 August 1948: '… weapons of mass destruction should be defined to include atomic explosive weapons, radioactive material weapons, lethal chemical and biological weapons, and any weapons developed in the future which have characteristics comparable in destructive effect to those of the atomic bomb or other weapons mentioned above'. W. Seth Carus, Defining Weapons of Mass Destruction, Center for the Study of Weapons of Mass Destruction, Occasional Paper, No. 8, (January 2012), pp. 9-10, available at http://wmdcenter.dodlive.mil/files/2006/01/OP8.pdf.

[2] For an overview of likely radioactive materials to be used in an RDD, health risks, decontamination and treatment, see Radiological Terrorism Fact Sheet, Centers for the Study of Bioterrorism and Emerging Infections (September 2002), available at http://www.bioterrorism.slu.edu/dirty/dirty.pdf.

threats has not yet materialized.[3] Without a regime on the safety and security of radioactive sources, which would incorporate the different existing mechanisms into a complete treatment of related issues, terrorists can make use of the loopholes and gain access to radioactive materials which are not accounted for. In the Middle East, the creation of such a regime could comprehensively protect against the threat of radiological terrorism, and also serve as a CSBM for the region by offering a feasible process on an approachable topic, en route to discussions of more complex WMD issues.

3. Radiological Weapons – Terrorists' Likeliest WMD of Choice

While it is generally agreed that an RDD is unlikely to cause many casualties or even cause substantial contamination,[4] its economic and psychological effects would nevertheless be extensive. Assumptions about the massive response to radiological weapon use, estimation of the ability to get to target, and assessment of the potential for casualties from being exposed to non-lethal doses of radiological materials could lead terrorists to choose this path. A terrorist explosion of an RDD would be more of a weapon of mass *disruption* than a weapon of mass *destruction*, yet its use would certainly constitute a new kind of terrorist attack.

Small groups can tactically use chemical, biological, radiological, and nuclear (CBRN) terrorism in order to attract the attention of the public, international media, and governments. A radiological terrorist attack would aim at impairing the normal conduct of social life (targeting, for instance, government offices or community facilities). Such an attack is perceived to be more easily implemented than a nuclear one: the likelihood of nuclear terrorism is quite improbable, considering that manufacturing an improvised nuclear device (IND) requires nuclear engineering know-how, extensive and well-equipped facilities, as well as obtaining fissile material, for which security and accounting systems are relatively extensive.[5] These requirements might force terrorists to abandon nuclear scenarios in favour of a radiological attack. Depending on the feasibility to the group given their financial and human resources, they could also choose to deploy a different kind of radiological dispersal device (not necessarily one that uses explosives) to conduct a radiological attack if they believed they had the capability to effectively disperse the agents.

The actual casualties from a radiological attack would be minimal when compared to an IND, but the aim would be to generate widespread fear in the local population, to create chaos and more importantly spawn mistrust in the government's ability to protect its citizens.

[3] See also Benjamin Hautecouverture, A Possible International Regime to Cover Radiological Materials, CESIM Research Paper, ICNND (October 2009), p. 19, available at: http://www.nonproliferation.eu/documents/other/benjaminhautecouverture4ecd0d76b3036.pdf; Hautecouverture concludes that a more integrated international regime to cover radiological materials is required.

[4] See, e.g., analyses by Christoph Wirz and Emmanuel Egger, Use of Nuclear and Radiological Weapons by Terrorists?, in: International Review of the Red Cross, vol. 87 no. 859 (September 2005), pp. 505-507, available at http://www.icrc.org/eng/assets/files/other/irrc_859_egger_wirz.pdf; Anthony H. Cordesman, Radiological Weapons as Means of Attack (8 November 2011), available at http://csis.org/publication/radiological-weapons-means-attack; Klaas van der Meer, The Radiological Threat: Verification at the Source, in: Verification Yearbook (2003), pp. 129-130, available at http://www.vertic.org/media/Archived_Publications/Yearbooks/2003/VY03_VanDerMeer.pdf; Peter D. Zimmerman with Cheryl Loeb, Dirty Bombs: the Threat Revisited, in Defense Horizons, no. 38 (January 2004), available at http://hps.org/documents/RDD_report.pdf.

[5] See Wirz and Egger, ibid, pp. 499-502.

A further substantial consequence of an RDD attack would be its economic toll, due to such factors as temporary or long-term loss of real estate value and disruption in economic activity depending on the relative capability of the state to clean up, on top of the direct extensive costs of decontamination.[6] The unique character of being able to ensure a continued impact in the aftermath of the attack (through contamination) is dramatic and could be enticing to terrorist groups.

There are various radioactive sources available for weaponization: radioactive materials can either be stolen or obtained through illegal contacts from facilities using such materials for commercial and medical purposes, where they are widely used. Potential radiological warfare agents that a group could have access to and choose to deploy can be categorized based on the degree of radiation and resulting damage. For instance, uranium ore is an alpha emitter that needs to be inhaled or consumed in large quantities to be destructive, hence not feasible for a small terrorist group. Americium-241 is used in small quantities in smoke detectors, medical equipment, and other industrial products, and would require a terrorist group to purchase large numbers of smoke detectors, which would be suspicious and infeasible; however, a front group for the production of items that require radioactive materials, e.g. smoke detectors, could be set up, subsequently diverting them. Despite their costs, caesium-137 and cobalt-60 are relatively easy to obtain and remove from medical facilities because they are commonly used in cancer treatment by radiation therapy.[7] Another option for the acquisition of materials by a non-state actor for the preparation of an RDD is theft of highly radioactive material from nuclear facilities during its transportation (e.g. from fuel cooling ponds to temporary or permanent storage locations). Given the rising interest in nuclear energy in the Middle East due to rising energy demands, water scarcity, and – in some countries – lack of natural resources, the amount of radiological material suitable for an RDD could increase dramatically over the next years.

The successful deployment of radiological weapons by violent non-state actors requires greater technical competence in the field than just acquisition of radioactive materials. Unless it is a suicide attack, it would require the protection of the terrorist against radiation by shielding during the handling of the materials and device in the operation. Given the nature of attacks in the Middle East, radioisotopes that are potentially available to terrorists could most easily be utilized in car bombs to disperse the radiological materials in urban areas. In such cases, the explosive itself would serve as the delivery system to make the design of the attack less complicated. Even though terrorists would not likely be able to disrupt major economic sites in the context of the Middle East (such as energy facilities, usually located in the hinterland) by this kind of attack, they could still utilize public fear to generate mistrust in the government. The relatively easy acquisition of primary radiological agents of harm by terrorists and the lack of a legal, organized framework on the international level to counter radiological weapons support the need for an appropriate regional response to securing these materials in order to prevent radiological terrorism. The appropriateness of this topic is further enhanced due to the lack of interest by states in the region to develop this class of weapons for their own use, which supports the potential feasibility of a dialogue on this issue.

[6] See e.g. analyses referred to in footnote no. 4 above.

[7] A more extensive review can be found in Charles D. Ferguson, Tahseen Kazi and Judith Perera, Commercial Radioactive Sources: Surveying the Security Risks, CNS Occasional Paper no. 11 (2003), available at http://cns.miis.edu/opapers/op11/op11.pdf.

4. Gradually Promoting Confidence – Starting with the Achievable

Due to the high levels of hostility and lack of trust between regional actors, arms control and regional security issues in the Middle East are extremely sensitive. The protracted conflicts and widespread tensions along several cleavages are not conducive to promoting regional security, and particularly in the context of WMD, the priorities of regional actors are not compatible and they therefore envision different – and contradicting – CSBMs as necessary preliminary steps.

The prominent negotiating technique according to which less complicated issues are handled first is intended to create momentum in a negotiation process, which would lead to and support the later negotiations on so-called 'hard nuts' – the sensitive aspects, most related to national interest and security, and therefore highly problematic for reaching compromise and agreement. Starting with the achievable can create momentum in the negotiation dynamics, leading to consideration of complex aspects in the spirit of initial accomplishment. While the focus on more procedural and less central aspects can be easily dismissed as marginal, and criticized for creating a false momentum, as well as artificial trust, which will easily collapse when the difficult – and more substantial – topics are reached, it is still a valuable endeavour which would produce substantial gains, especially in times of stalemate.

While the 'traditional' WMDs are too sensitive to be directly handled and, when discussed, tend to drive the parties deeper into their positions, a regional process on the radiological threat could create progress on a class of weapons that practically does not exist in the region for lack of military utility, but the threat of which is shared by all states. With agreement on how to counter the radiological threat and the establishment of a regional code of conduct on securing radiological materials, some valuable momentum could be created, and should not be taken lightly in a region where agreement is not easily reached. Such a process will also create and sustain a routine and infrastructure for cooperation in the region which could be leveraged to address more intractable issues at a later time. Lastly, a continued and sustained dialogue on practical issues of regional security and arms control can be considered in and of itself a meaningful goal in the Middle East.

5. A Radiological Materials-Secured Zone for the Region: A Possible Way Forward?

With respect to the Middle East zone free of weapons of mass destruction conference, endorsed by the 189 member states during the 2010 Review Conference of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) to take place by December 2012 in Finland, a regional process aimed at securing radiological materials in the Middle East could serve as a meaningful CSBM. The Middle East, a conflict-prone region in need of arms control initiatives to promote regional security, could re-start the regional arms control process with a radiological materials-secured zone.

Addressing matters of security and cooperation on radiological materials at a regional level, rather than globally, offers the possibility of creating a regime which is more comprehensive as well as more profound and which deals with specific concerns and realities in the region

with greater efficacy.[8] Because many sporadic arrangements already exist on the international level (as overviewed in the annex), the fundamental definitions and standards of such a zone should be based on the International Atomic Energy Agency's (IAEA) internationally agreed standards for safety and protection of radiological materials.[9]

For the implementation of such a regime, operational challenges require an adaptive architecture and robust infrastructure to detect radiological sources, especially when they are heavily shielded. Fortunately, there is a natural characteristic of radioactive materials that makes them suitable for detection and regulation: they are quite difficult to conceal. 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. In order to improve threat identification, advanced neutron and gamma detectors and intercommunicating radiation detection systems are needed. Work on developing a regional radiological materials secured zone – or a code of conduct to that effect – can begin immediately, based on existing and available technologies for protection and detection of radiological materials and the standards and procedures developed by the IAEA.

A regional dialogue on the establishment of a radiological materials-secured zone would be an on-going process aimed at addressing the varied aspects handled on the global level– some of which are not comprehensive, others not legally-binding – and incorporating them together in an agreed framework such as a code of conduct. The different aspects are already addressed sporadically, mostly through IAEA standards and recommendations and its regime on the international shipment of radiological materials as well as physical protection conventions; and thorough implementation of these measures would enable identification and securing of radiological materials. But a regional arrangement could integrate these elements into a comprehensive system and also incorporate unique mechanisms for regional cooperation, such as the promotion of a regional strategy for the response to RDDs and mitigation of their consequences, and initiation of joint research and development projects on peaceful uses of radioactive materials. This could include, *inter alia*, the following considerations:

- Setting up national registers of radioactive materials and standards for export license systems, as well as national authorities for regulation of licenses, and identifying required updates for national legislation and standards for legislation at the state level
- Establishing standards for securing radioactive resources and for upgrading physical protection
- Developing measures to detect and secure radioactive materials that are outside of regulatory control to counter smuggling

[8] While a global regime must fit many different actors with different considerations and perceptions, and is therefore often diluted to suit all, a regional arrangement can be tailored to the specific realities and requirements of a particular region. The idea of creating nuclear weapons free zones is based on this assumption – that a regional arrangement can be more comprehensive and will offer regional actors a greater sense of security, by addressing their specific concerns.

[9] See, e.g., IAEA's extensive work on radiation protection safety standards: http://www-ns.iaea.org/standards/documents/topics.asp?sub=160.

- Formulating programmes for capacity-building through public education and awareness raising, as well as formulating response strategies
- Designing mechanisms for regional information exchanges and sharing, e.g. on techniques used for protection of radiological materials and recovery of orphan sources.
- Formulating inspection procedures for border crossings and standardized equipment usage

Such a process can be augmented or initiated with a regional statement (in the form of a joint statement or a self-declared moratorium) or even a formal ban (in the form of an agreement) prohibiting the production, acquisition, development and stockpiling of radiological weapons at the state level. Such a statement or agreement can be based on the planned Treaty Prohibiting Radiological Weapons, which was negotiated in the Conference on Disarmament in the 1980s (for more on the CD's work on radiological weapons, see the annex below). This could in and of itself serve as a CSBM by completely removing a class of weapons from the region and as a declaration it would not require an extensive investment of time and resources. It would, however, constitute a genuine achievement – a first step towards an eventual WMD-free zone, banning also the remaining three classes of WMD, namely chemical, biological and nuclear.

The focus on the radiological threat as the subject matter of a regional CSBM would be most feasible at this time, much more so than the other WMD types, which are the obvious 'hard nuts'. The radiological threat could be addressed at a regional level as an exercise in confidence building, which would secure against a possible threat while avoiding the more problematic classes of weapons. If a regional arrangement on radiological materials could be reached, the effect would be twofold – it would strengthen the security of radiological sources and protect against radiological terrorism, and perhaps more importantly, it would have achieved some regional agreement and could further pave the way towards agreement on the 'tougher' issues.

Annex

Overview: Existing Arrangements relating to the Protection of Radiological Material

Radiological weapons and the potential use of radioactive material for hostile purposes have been on the international agenda since the beginning of the nuclear age. However, various political factors and negotiation complications resulted in an inadequate level of control exercised over radioactive materials, although these materials were frequently the main agents of concern in illicit nuclear trafficking incidents, especially in former Soviet Union countries targeted for theft.[10]

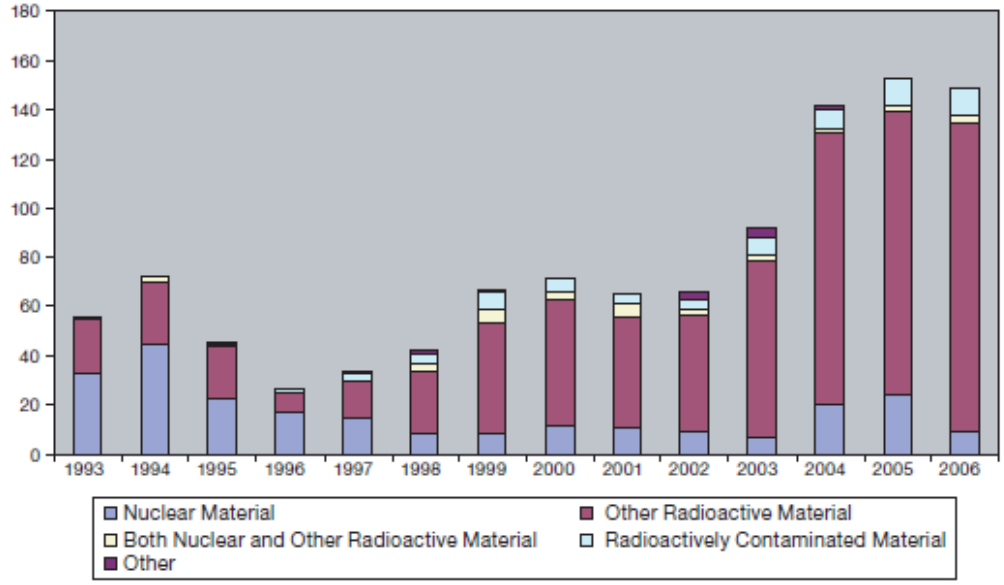

Figure: Incidents Confirmed to the Illicit Trafficking Database 1993-2006
(Source: http://www-pub.iaea.org/MTCD/publications/PDF/pub1309_web.pdf)

Radiological weapons have been on the agenda of the Conference on Disarmament (CD) since the late 1970's (agenda item entitled 'New types of weapons of mass destruction and new systems of such weapons; radiological weapons'). The CD worked extensively on negotiating a **Radiological Weapons Convention** between 1980 and 1992. In 1978, the General Assembly's Special Session on Disarmament called for the conclusion of a convention 'prohibiting the development, production, stockpiling and use of radiological weapons' – the purpose of this endeavour was to prevent states from acquiring radiological weapons. This item was added to the agenda of the CD in 1979, and in the following year an Ad Hoc Committee on radiological weapons was established, which from 1983 to 1992 was divided in two contact groups – one dealt with prohibition of radiological weapons, and the

[10] The International Atomic Energy Agency's Illicit Trafficking Database recorded 1773 incidents between January 1993 and December 2009 that involved illegal movement of nuclear or radioactive materials, 351 of which were unauthorized possession of materials. According to the Database on Nuclear Smuggling, Theft, and Orphan Radiation Sources, 736 cases of 'orphan sources' had been either lost, accidentally found or misrouted between 1991 and 2009. Martin Matishak, Danger of Trafficked Nuclear, Radiological Materials Lingers, Global Security Newswire (16 November 2011), available at http://www.nti.org/gsn/article/danger-of-trafficked-nuclear-radiological-materials-lingers-experts/.

other with the prohibition of attacks against nuclear facilities.[11] The Ad Hoc Committee on radiological weapons was convened for the last time in 1992, after which the CD abandoned the topic due to irreconcilable differences regarding issues of verification and definition as well as disagreement over the required relationship between the ban on radiological weapons and the prohibition of attack against nuclear facilities and instead focused on negotiations of the Comprehensive Nuclear Test-Ban Treaty.

In the aftermath of the 9/11 attacks, the use or threat of use of radiological and nuclear materials by violent non-state actors and terrorist groups became a major concern, as members of Al-Qaeda expressed interest in acquiring means to catastrophic terrorism. With regard to guidelines on protection of radioactive material, the focus shifted from safety of the public and of employees to protection against theft and malevolent use. Indeed, in the last decade several arrangements relating to radiological material have been established. In the CD as well, an attempt was made to re-ignite discussions on the topic, but since the negotiating body has been absorbed in disputes over items (namely, nuclear disarmament, prevention of an arms race in the outer space, negative security assurances and the Fissile Material Treaty), it has been deadlocked and no progress has been made on any of the items.

While the work of the CD in 1980-1992 focused on prohibiting radiological weapons, the IAEA established a network of arrangements regarding the protection of radioactive materials, most notably its recommendations set out in its INFCIRC/225/Rev.4 from 1999, entitled '**Physical Protection of Nuclear Material and Nuclear Facilities'** (originally published in 1975 as INFCIRC/225), which complements the '**Convention on the Physical Protection of Nuclear Material'** from 1980. The Convention deals exclusively with nuclear materials used for peaceful purposes while they are transported internationally; an amendment, adopted in 2005 but not yet in full effect, extends its scope to include nuclear material in domestic use, storage, and transport, and the protection of nuclear materials and facilities against sabotage. In 2004, the IAEA published its '**Code of Conduct on the Safety and Security of Radioactive Sources'** (IAEA/CODEOC/2004). This revised version of a Code from 2001 mostly reflected the concerns, following 9/11, of *deliberate* acquisition of radioactive sources for malicious use, whereas before the central concerns were of theft out of ignorance.[12]

Beyond the efforts of the IAEA, the **Global Threat Reduction Initiative** from 2004, led by the United States, dealt with the physical protection upgrades of civilian nuclear and radiological sites worldwide, and the **UN Security Council Resolution 1540,** from the same year, called on states to enhance physical protection, border controls and accounting and securing of sensitive materials for the prevention of proliferation of WMDs to non-state actors.

In 2005, the **International Convention for the Suppression of Acts of Nuclear Terrorism** opened for signature and was intended to fill in the gaps regarding possible acts of nuclear terrorism which were not dealt with in the context of the Convention on the

[11] Daniil Kobyakov and Nicolas Florquin, 'Dirty Bomb' Threat Awakens Dormant Disarmament Conference, Center for Nonproliferation Studies (26 August 2002), available at http://cns.miis.edu/stories/020826.htm.

A draft Treaty Prohibiting Radiological Weapons from 1983 can be found under the Report of the Committee on Disarmament, General Assembly Official Records of the Thirty-Eighth Session, Supplement no. 27 (A/38/27).

[12] Report of the International Commission on Nuclear Non-Proliferation and Disarmament (Gareth Evans and Yoriko Kawaguchi, co-chairs), Eliminating Nuclear Threats: a Practical Agenda for Global Policy Makers (2009), p. 120, available at http://icnnd.org/Reference/reports/ent/pdf/ICNND_Report-EliminatingNuclearThreats.pdf.

Physical Protection of Nuclear Material. It requires state parties to criminalize and penalize nuclear terrorism, defined as the use of nuclear/radiological materials with toxic, explosive or other dangerous properties for the purpose of killing or injuring persons, damaging property or the environment or for coercion of states and international organizations.

Most recently, the **2012 Seoul Nuclear Security Summit** included the consideration of protection against dirty bombs and attacks against nuclear facilities. The Seoul Summit took place after the Fukushima nuclear accident, which set the stage for a clear message on the overlap between safety and security of radioactive sources. The final Seoul Communiqué identified the need to strengthen physical protection and illicit trafficking of radiological materials, and encouraged international cooperation aimed at preventing radiological terrorism. These issues, as well as the non-state threat in this context, will be the focus of the next Nuclear Security Summit, to be hosted by the Netherlands in 2014.