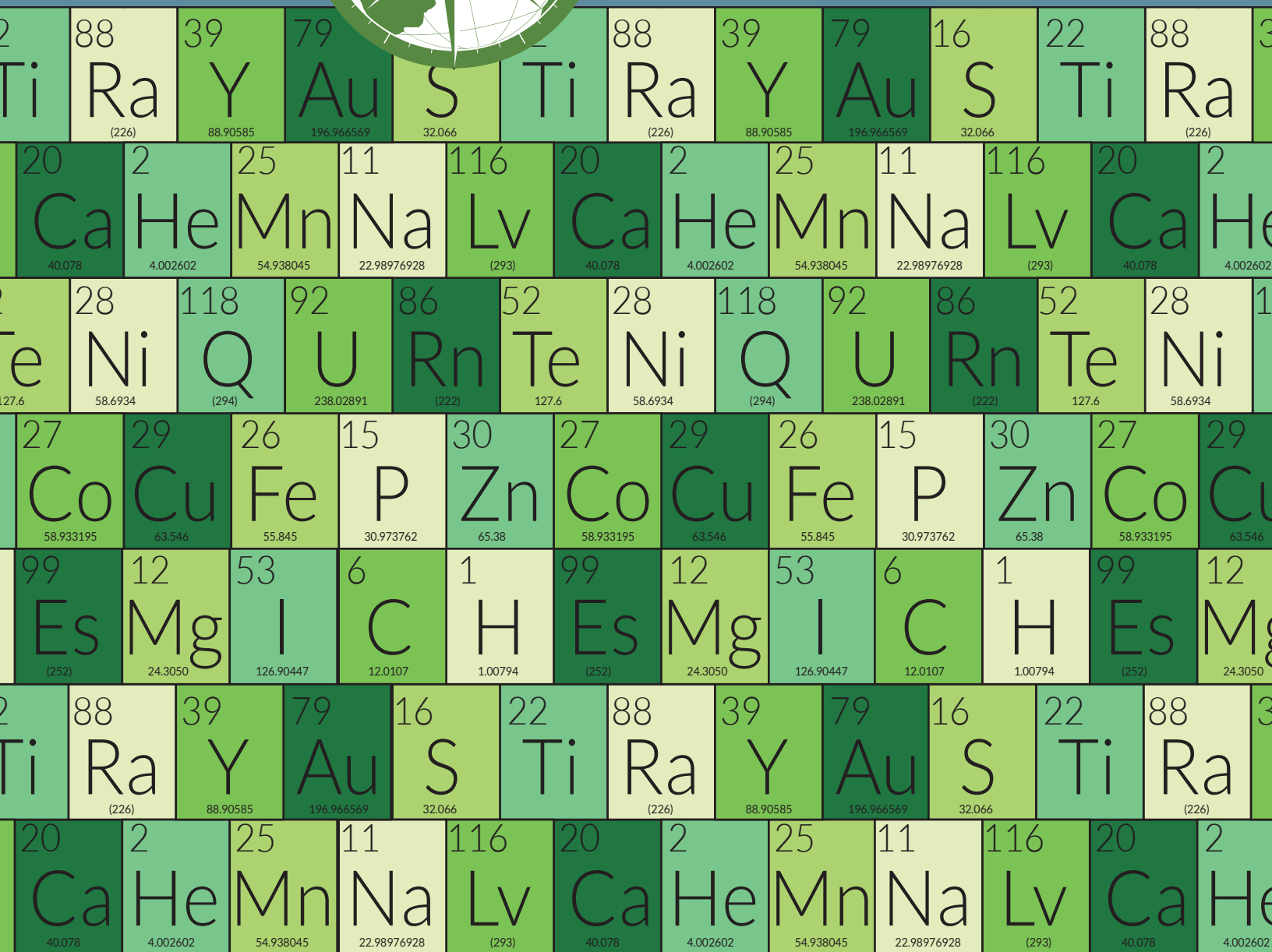


1540 COMPASS

SUMMER 2015 — ISSUE 9



2	88	39	79		88	39	79	16	22	88	3
Ti	Ra	Y	Au	S	Ti	Ra	Y	Au	S	Ti	Ra
(226)	88.90585	196.966569	32.066		(226)	88.90585	196.966569	32.066		(226)	
20	2	25	11	116	20	2	25	11	116	20	2
Ca	He	Mn	Na	Lv	Ca	He	Mn	Na	Lv	Ca	He
40.078	4.002602	54.938045	22.98976928	(293)	40.078	4.002602	54.938045	22.98976928	(293)	40.078	4.002602
	28	118	92	86	52	28	118	92	86	52	1
Te	Ni	Q	U	Rn	Te	Ni	Q	U	Rn	Te	Ni
127.6	58.6934	(294)	238.02891	(222)	127.6	58.6934	(294)	238.02891	(222)	127.6	58.6934
27	29	26	15	30	27	29	26	15	30	27	29
Co	Cu	Fe	P	Zn	Co	Cu	Fe	P	Zn	Co	Cu
58.933195	63.546	55.845	30.973762	65.38	58.933195	63.546	55.845	30.973762	65.38	58.933195	63.546
99	12	53	6	1	99	12	53	6	1	99	12
Es	Mg	I	C	H	Es	Mg	I	C	H	Es	Mg
(252)	24.3050	126.90447	12.0107	1.00794	(252)	24.3050	126.90447	12.0107	1.00794	(252)	24.3050
2	88	39	79	16	22	88	39	79	16	22	88
Ti	Ra	Y	Au	S	Ti	Ra	Y	Au	S	Ti	Ra
(226)	88.90585	196.966569	32.066		(226)	88.90585	196.966569	32.066		(226)	
20	2	25	11	116	20	2	25	11	116	20	2
Ca	He	Mn	Na	Lv	Ca	He	Mn	Na	Lv	Ca	He
40.078	4.002602	54.938045	22.98976928	(293)	40.078	4.002602	54.938045	22.98976928	(293)	40.078	4.002602

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1540 COMPASS

<http://cits.uga.edu/1540compass>

A journal of views, comments, and ideas for effective implementation of UN Security Council Resolution 1540 to prevent WMD proliferation and terrorism by non-state actors.

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The Compass welcomes letters and articles from all concerned with 1540 implementation. Articles should be 1,500-2,000 words in length and written in English. Digital photographs should be submitted in their native format, typically JPEG; scanned photographs should be saved in a lossless format like TIFF or BMP. Send submissions to compass@cits.uga.edu.

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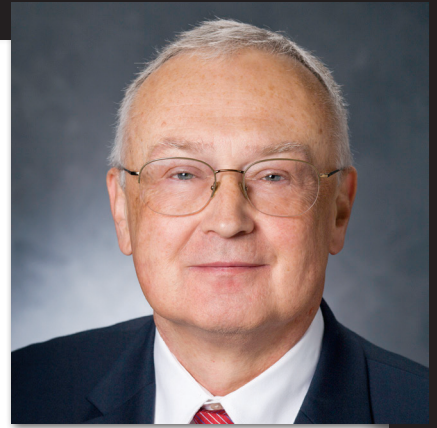
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From the Editor:



Two major international events with cross-cutting agendas are scheduled for 2016. Taking place almost back-to-back are the Nuclear Security Summit (NSS)—the fourth, and apparently last, in the series—and the Comprehensive Review of the Status of Implementation of Resolution 1540. Whether either will generate far-reaching and sustainable results is a matter of concern not only to governments but also the public. The public is a major stakeholder in both initiatives, but experience demonstrates that civil society input in the process is not easy to predict.

A review of the record of public advocacy reveals several ways nongovernmental communities can deliver their message. In June 2015, a report entitled *The Results We Need in 2016: Policy Recommendations for the Nuclear Security Summit* was presented in Vienna and Washington DC by the Fissile Material Working Group (FMWG), a coalition of eighty civil-society organizations from around the world that share the goal of preventing nuclear terrorism. Produced by a group of international experts, the report focuses on a wide range of items, from eliminating highly enriched uranium from civilian applications to nourishing nuclear security culture.

Now, it is the turn of the 1540 community. Speaking at a briefing last April, the 1540 Chair emphasized that the Comprehensive Review should evaluate the 1540 Committee's outreach to states and civil society, including academia, industry, professional associations, and lawmakers. I put it to you: what will it take for the 1540 nongovernmental community to make a significant contribution to the review process?

A stylized, handwritten signature in black ink, appearing to read 'I. Khripunov', with a long horizontal flourish extending to the right.

IGOR KHRIPUNOV
EDITOR, 1540 COMPASS
CENTER FOR INTERNATIONAL TRADE & SECURITY



1540 COMPASS DISCUSSION FORUM

*Please send letters for the Discussion Forum to Editor
in Chief Igor Khripunov at i.khripunov@cits.uga.edu.
Letters should not exceed 500 words.*

STATUS OF BANGLADESH'S IMPLEMENTATION OF UNSCR 1540

Bangladesh strongly believes in the nonproliferation of all weapons of mass destruction (WMD), including nuclear, chemical, and biological weapons, as well as their means of delivery. Bangladesh sees disarmament and nonproliferation of all weapons of mass destruction as an instrument and precondition for enhancing international peace and security. Bangladesh's commitment and priority to disarmament, both nuclear and conventional, flows from her constitutional obligations to the goal of a general and complete disarmament. Bangladesh steadfastly supports a multilateral approach to nonproliferation and disarmament. In keeping with these principles, Bangladesh has become party to a number of international legal instruments on disarmament and nonproliferation, and enacted domestic laws and regulations putting these instruments into force.

Bangladesh remains committed to enforce and take effective measures for implementation of the binding obligations pursuant to UN Security Council resolution (UNSCR) 1540. Bangladesh submitted its first national report on the implementation of Security Council resolution 1540, titled "Non-proliferation of Weapons of Mass Destruction," on June 28, 2006. Bangladesh submitted its second national report on the implementation of Security Council resolution 1540, on June 6, 2009. However, it is evident that Bangladesh needs to address certain legal, regulatory, administrative, and institutional issues in order to ensure compliance with UNSCR 1540, and to submit more comprehensive reports on a regular basis. To that effect, Bangladesh has already initiated working

with the United Nations, the United Nations Regional Center for Peace and Disarmament in Asia and the Pacific (UNRCPD), South Asian Association for Regional Cooperation (SAARC) member states, and other partners to fulfill those obligations flowing from UNSCR 1540.

In order to create more awareness among national stakeholders involved in implementing UNSCR 1540 and other relevant resolutions of the Security Council, the Government of Bangladesh has formed a National Committee headed by the foreign secretary as mandated by the National Coordination Committee on Anti-Money Laundering and Counter Terrorism. The committee reviews and monitors compliance with the relevant UNSCRs.

Lastly, the National Committee on UNSCR 1540 implementation organized a national workshop in Dhaka on April 21-23, 2014, in order to focus on Bangladesh's compliance with UNSCR 1540. Attendees addressed existing and newly identified gaps in the legal and regulatory framework, and espoused closing these gaps through greater capacity-building and interagency coordination. The workshop was organized in collaboration with the UNSCR 1540 Committee based in New York and the UNRCPD based in Kathmandu, Nepal. Gaps and challenges were identified by the participants with regard to UNSCR 1540 obligations. What remains to be done in capacity-building, with the help of technical assistance from development partners such as the United States and European Union, was also addressed.

Md. Shafiqul Islam
DEPARTMENT OF NUCLEAR ENGINEERING
UNIVERSITY OF DHAKA, BANGLADESH

CHEMICAL, BIOLOGICAL, AND
RADIATION SAFETY AND SECURITY
CENTER (CBRSSC) IN BABYLON
UNIVERSITY

The harmful effects of chemical, biological, and radiological (CBR) materials are not limited to students and staff who work with them directly. They affect all workers at the university, including students and staff who do not deal with CBR materials. Sometimes their harmful effects reach villages and towns close to the university.

- The effects of some CBR materials do not appear immediately or instantaneously, but instead may appear after a long time.
- The direct damage from CBR-related accidents constitutes only a small percentage of the indirect damage.

Our vision at CBRSSC is to maintain a safe and secure environment at Babylon University, free of the risks from chemical, biological, and radioactive materials, and to improve the quality of life for students, staff, faculty members, and society through our Chemical Safety and Security, Biological Safety and Security, Radiation Safety and Security, university security, emergency, environmental protection, and medical departments. In order to achieve this vision, the center does the following:

1. Conducts training courses for different levels that teach the risks, prevention, safety and security principles, as well as proper storage and handling methods for CBR materials.
2. Monitors educational and research laboratories and warehouses through periodically scheduled and ad hoc visits. Evaluates the work conducted on-site through these visits. Conducts comprehensive assessments of CBR safety and security procedures and reports them to the proper authorities.
3. Designs a contingency plan for each laboratory, department, and administrative or service entity in the department, college, or university. This also includes the health education department, the fire department, and health emergency units, as well as the security offices, as the university prepares an integrated contingency plan in the event of an incident.

4. Prepares an evacuation plan for each laboratory, department, college, and administrative or service entity in the department, college, or university. This also includes setting up an integrated evacuation plan for the university in coordination with university security in the event of an incident.
5. Creates and distributes cautionary directions, including warning signs, emergency exit signs, and fire extinguishers signs, including extinguisher types and how to use them. CBRSSC educates the university community and the community as a whole on CBR safety and security.
6. Refurbishes research and study laboratories and CBR material warehouses to meet CBR safety and security requirements, and considers CBR safety and security issues when planning for the construction of such facilities in the future.

Prof. Falah Hassan Hussein, Ph.D.
BABYLON UNIVERSITY, IRAQ

MEETING OF FORMER 1540
COMMITTEE EXPERTS, CAPE TOWN,
SOUTH AFRICA, MAY 28-29, 2015

Through resolution 1977 (2011), the Security Council invited the 1540 Committee “to consider developing, in close cooperation with relevant international, regional and sub-regional organizations and other United Nations bodies, ways to utilize and maintain expertise, including, in particular, of former experts of the group, that could be made available for specific missions and assistance needs regarding the implementation of resolution 1540 (2004).”

As of May 1, 2015, twenty-six individuals had been appointed by the United Nations Secretary-General to serve as 1540 Committee experts, covering a broad array of various expertise. Of these, eighteen individuals are now former experts, all of whom potentially represent an important and useful resource for the 1540 Committee. During their tenure, they developed their expertise and skills and acquired a unique institutional memory of key aspects of the implementation of the resolution. Furthermore, many of these experts continue to be active on issues related to resolution 1540, with the ability to continue to support the activities of the



Committee and its current experts in a variety of ways.

The South African-based Institute for Security Studies (ISS), with the support of the UN Office for Disarmament Affairs and in liaison with the 1540 Committee Group of Experts, hosted the meeting of former 1540 Committee experts in Cape Town, South Africa, from May 28-29, 2015. The meeting was supported by UNODA using funds from voluntary contributions by the Governments of the Republic of Korea and the United States of America.

The purpose of the meeting of former experts was to provide them with an opportunity to contribute to an accurate appraisal of the international community's collective efforts aimed at facilitating states' full implementation of resolution 1540, taking into account achievements so far, challenges faced, and possible options for enhanced efficiency and effectiveness. It was also anticipated that the meeting would make a valuable contribution to the 2016 Comprehensive Review of resolution 1540. Participants included representative of the most recent former chair of the 1540 Committee, Republic of Korea; twelve former experts (from Argentina, Australia, Brazil, Eritrea, France, Germany, India, the United Kingdom and the United States); three present experts (Mexico, South Africa and the United Kingdom); and a representative of UNODA.

In preparation of the meeting, and in order to facilitate substantive discussions, each of the former experts was invited to prepare and present a paper addressing important issues that remain relevant to the work of the Committee, drawing upon his or her experience and sharing the lessons learned. Topics covered by the presentations and discussions included cooperation with international, regional, and subregional organizations; assistance and capacity-building; potential and limits on mobilizing civil society and nongovernmental organizations; lessons learned with regard to private sector and industry, including in the context of the Wiesbaden process; the identification of effective practices; the tools of the 1540 Committee (Matrix, legislative database, visits to states, etc.); transparency and outreach efforts, and how to make best use of existing resources within the 1540 Committee, its Group of Experts, and the UN Secretariat.

The ISS plans to publish an edited version of the papers and the discussions as a contribution to the 2016 Comprehensive Review later this year.

Noel Stott

SENIOR RESEARCH FELLOW
TRANSNATIONAL THREATS AND INTERNATIONAL CRIME
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Nicolas Kasprzyk

INTERNATIONAL CONSULTANT
INSTITUTE FOR SECURITY STUDIES

CHARTING NEW GLOBAL POSSIBILITIES THROUGH 1540 COMMITTEE'S STRATEGIC ALLIANCE WITH CIVIL SOCIETY

During my tenure as a member of the 1540 Committee Group of Experts, I became a strong supporter of seeking synergies among UNSCR 1540 areas of implementation, helping complement and strengthen the 1540 Committee's work by charting new global possibilities. Now, as a former member of the Group of Experts, I hereby offer practical recommendations for mapping the way forward for civil-society engagement. The summary below is excerpted from the paper I presented at meeting of former 1540 Committee experts in Cape Town, South Africa, on May 28-29, 2015.

- The 1540 Committee website should include information detailing the Committee's engagement with civil society (besides outreach and awareness raising), recognizing civil-society efforts to counter WMD and help national implementation of resolution 1540 (2004), and calling on civil society for information on relevant effective experience, lessons learned, and effective practices in the areas covered by UNSCR 1540.
- The 1540 Committee should invite relevant civil-society organizations (CSO), such as VERTIC and the Center for International Trade and Security (CITS) to join the network of assistance providers and list them on the 1540 Committee website.
- The 1540 Committee should invite CITS to brief the Committee members on the tools and



methodologies for assessing and enhancing chemical, biological, radiological, and nuclear (CBRN) security culture. Such a culture is intrinsic to the “implementation of appropriate controls over related materials” and complementary to appropriate effective laws prohibiting activities involving the proliferation of nuclear, chemical, and biological weapons and their means of delivery to non-State actors, in particular for terrorist purposes as mandated by UNSCR 1540.

- The 1540 Committee and its Group of Experts should work with the Counter-Terrorism Committee and Counter-Terrorism Committee Executive Directorate (CTED) to find ways to actively engage civil society and leverage CTED’s global research network of CSOs to monitor WMD proliferation and 1540-related issues.
- The 1540 Committee and the Security Council at large should seek ways to link thematically distinct but operationally connected Security Council agenda topics such as WMD nonproliferation and Women, Peace, and Security.
- The UN Office on Disarmament Affairs (UNODA) should sponsor and the 1540 Committee should clear a CSO-developed technical reference guide about resolution 1540, to be used by states on a voluntary basis in national implementation efforts.
- UNODA should build a network of civil-society points of contact from its outreach events and forward to them a biannual invitation from the UN Secretary-General soliciting submissions on disarmament and nonproliferation education. UNODA should incorporate the information CSOs supply on education and training resources relating to resolution 1540 into its reporting and post it on the UNODA Disarmament Education website.
- UNODA should organize workshops to exchange information on how to improve education and training in areas related to resolution 1540, including through the development of e-modules, courses, games and simulations, and to discuss ways in which to sustain activities and initiatives in these areas.

- The 1540 Committee and UNODA should support the establishment of a civil-society monitoring regime for implementation of resolution 1540, similar to the BioWeapons Monitor and the Landmine and Cluster Munition Monitor in their respective domains.

I hope that civil society will continue to be involved in UNSCR 1540 implementation, assistance, and assessment, and will make its voice heard at the upcoming 2016 Comprehensive Review of UNSCR 1540.

Dana Perkins, Ph.D.

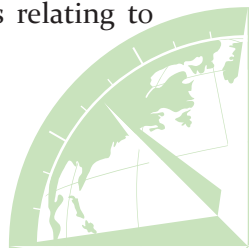
FORMER MEMBER OF THE UN SECURITY COUNCIL 1540
COMMITTEE GROUP OF EXPERTS

DEVELOPMENT OF NUCLEAR SECURITY CULTURE IN “CLOSED NUCLEAR CITIES”

Russian “closed nuclear cities” are the cities where the Soviet nuclear program and its key facilities were run. At this moment, closed nuclear cities are the place of maximum concentration for the Russian nuclear industry. Novouralsk is one of these cities. If a nuclear security culture really exists in closed nuclear cities, then how robust is it? How can a nuclear security culture be developed and enhanced?

The Novouralsk Technological Institute (NTI) of the National Research Nuclear University (MEPhI) is located in Novouralsk. One of NTI’s most important objects has always been training personnel for JSC “UEIP,” one of the greatest world enterprises for uranium enrichment. Obviously, training specialists and administration personnel must acquaint themselves with nuclear security culture. It is one of the bases for ensuring safety and security of nuclear materials. That is why in 2012, we designed and included a curriculum for training of bachelor’s students from all technical specialties: the “Nuclear Security Culture” course.

In addition, NTI has positive experience collaborating with schools. We regularly deliver presentations in front of school students. Our plans also include developing team projects for university students and school students on issues relating to nuclear security culture.



NTI is also an organizer of a number of educational and scientific events designed to spread knowledge and best practices pertaining to nuclear security culture.

Our plans for continuing scientific and educational activities in the sphere of nuclear security culture include creating a working group and instituting regional collaboration toward development of nuclear security culture in closed nuclear cities. In prospect, the creation of a center for the study of nuclear-security-culture problems is possible. One more question: does such a culture really exist, and what level has it attained? That is the reason why the task of assessing the presence and level of nuclear security culture, together with its development and implementation, seems to be quite important for the future.

Grigory Zinovyev, Ph.D.

NOVOURALSK TECHNOLOGICAL INSTITUTE OF NATIONAL
RESEARCH NUCLEAR UNIVERSITY (MEPHI)

POLICY RECOMMENDATIONS FOR 2016 NUCLEAR SECURITY SUMMIT

The risk that terrorists will obtain the materials to build a nuclear bomb or a radioactive “dirty” bomb is one of the greatest dangers facing the global community. A nuclear attack in a major city could kill hundreds of thousands of people and would have economic, security, and societal impacts far beyond the immediate tragedy.

A group of respected international experts has released recommendations that can help prevent such a tragedy in a new report entitled *The Results We Need in 2016: Policy Recommendations for the Nuclear Security Summit* (http://www.fmwg.org/FMWG_Results_We_Need_in_2016.pdf).

In 2010, U.S. President Barack Obama launched the Nuclear Security Summit (NSS) process, inviting dozens of heads of states to Washington, DC to discuss nuclear security. Additional summits were held in 2012 in Seoul, Republic of Korea, and in 2014 in The Hague, the Netherlands. The summits have brought high-level attention to the issue of protecting vulnerable nuclear and other radioactive materials, which has resulted in actions that made the world a safer place for people across every continent.

However, the mission is not yet complete. With the final summit coming up in 2016, it is imperative that the NSS process result in a legacy that will sustain achievements and close remaining gaps in the global nuclear-security architecture. While additional summits may be planned, they are unlikely to be of the same scope, scale, and frequency. The world leaders participating in the 2016 NSS must not let this opportunity slip by.

Understanding the critical importance of the 2016 summit, civil-society experts from the Fissile Materials Working Group (FMWG) developed innovative and actionable policy recommendations on three topics:

- 1 Elimination of Highly Enriched Uranium in Civilian Applications, chaired by Elena Sokova
- 2 Enhancing the Security of Military Nuclear Materials, chaired by James Doyle
- 3 Information Sharing, Standards and Best Practices, and Security Culture, chaired by Anita Nilsson

The policy recommendations in *The Results We Need in 2016* could be implemented through the NSS process and beyond to better protect communities around the world from the threat of nuclear terrorism.

Lesley McNiesh

COORDINATING DIRECTOR, FISSILE MATERIALS WORKING
GROUP
WASHINGTON, DC, USA

A PROPOSAL ON HOW TO BUILD A SECURITY CULTURE IN THE CHEMICAL SUPPLY CHAIN AND AMONG DOWNSTREAM USERS

Chemical, biological, radiological, nuclear, and explosive security is a multifaceted matter. Dealing with it in a time of asymmetric conflicts exceeds the competencies of traditional stakeholders. That is particularly true in the chemical sector, because many chemicals not covered by legally binding schedules may have dual-use potential and be diverted and used to cause damage on a public scale. To reduce the public threat caused by misused chemical materials, the capacity of traditional stakeholders, mostly state institutions, may and should be enhanced by voluntary input from those who use, trade, or possess hazardous materials.



A number of manuals and good practices voluntarily assembled by industry associations exist, covering how to secure one's own resources, reduce the vulnerability of infrastructure and transport, and raise vigilance over the flow of hazardous substances. Those manuals or guidelines are mostly single-problem-oriented (e.g., physical security, transport, or customer identification), however, and are rarely built on multifaceted input. That makes practical information scattered. On the communication side, they contain strict but extensive checklists and often introduce sophisticated reporting procedures, an approach burdensome for small businesses with too few resources and too little knowledge about the hazards entailed by chemicals. That in particular concerns dual-use hazards, which are different from the hazards posed by processing and using these substances. The latter are covered sufficiently by law, the flow of information flow, and verification routines. Accordingly, a project dubbed "Toward the Chemical Security Culture" has been devised under the program "Prevention and Fight against Crime" run by the Home and Justice Directorate General of the European Commission. The program will build security culture throughout the chemical supply chain, deliver flexible security guidance, and create a network for disseminating knowledge and awareness.

The program will run in stages. Necessary knowledge and practices from various stakeholders were assembled in the first stage. The stakeholders—including the police, internal security and critical infrastructure managers, export and chemical market control officials, attorneys, overseers of chemical safety and crisis management, first responders, and mitigation services—were invited to a workshop to adopt a comprehensive curriculum for the chemical security program. A chemical security train-the-trainers syllabus was prepared in the second stage. A group of volunteers seconded from the companies that joined the project studied chemical security according to the curriculum. The trainers, after completing the training, took part in a third stage, teaching chemical security to the representatives of small and medium businesses in the chemical supply chain during a series of regional training sessions. All training participants registered with a specially designed network run by the International Center of Chemical Safety and Security. The network is dedicated to disseminating chemical security culture, practical information, and awareness, and builds on

those interested in chemical security and ready to exchange views and ideas.

Lesław Górniak

REACH AND CLP CENTER AT INDUSTRIAL CHEMISTRY
RESEARCH INSTITUTE, WARSAW, POLAND

A NEW JOURNAL ON STRATEGIC TRADE MANAGEMENT

I would like to inform Compass readers about Strategic Trade Review, a new peer-reviewed journal dedicated to strategic trade control.

Globalization, complex supply chains, security threats, and new international legal instruments have placed strategic trade controls at the forefront of nonproliferation and broader security discussions. Concurrently, research interest in the field has increased worldwide as more questions are being asked regarding how to tackle new challenges, even on distinctly specific aspects of the field. In order to encourage the research community's ability to grow and flourish, with the aim of establishing trade controls as a veritable academic field, Strategic Trade Review has released a call for papers for its inaugural issue, to be published in autumn 2015.

Strategic Trade Review is a peer-reviewed journal dedicated to conventional and dual-use trade controls. The journal will publish high-quality, peer-reviewed articles that tackle the complex field of trade and security. Articles will cover the following areas: international law, technological developments, trade analysis, good practices, implementation analysis, risk assessment, enforcement, prosecution, capacity-building (strategy, methodology, case studies), comparative studies, historical analysis, licensing issues, sanctions, definitions and discourse, patterns and trends, jurisdiction, international and regional cooperation, industry outreach and communication, and other related topics.

Due to the global nature of strategic trade, the journal aims to attract contributions from around the world in order to publish analysis from as diverse a base as possible. More information regarding the journal is available at <http://local.droit.ulg.ac.be/jcms/service/49/revue.php>.

Andrea Viski

EU JOINT RESEARCH CENTER, ISPRA, ITALY





U.S. Export and Trade Controls and How They Intersect with UNSCR 1540

Interview with Deputy Assistant US Secretary of State Simon Limage

1540 Compass: What are the different ways in which US assistance to other countries on Strategic Trade Management promotes the mandate of UNSCR 1540?

Limage: So to give your readers a sense of the importance of this mission I thought I would say a few words about the 1540 resolution, what it is and what it is not, and then how the EXBS Program, which is the Export Control and Related Border Security Program which I oversee relates to 1540 as a bilateral assistance mechanism. In 2004 the UN Security Council adopted Resolution 1540 to combat the proliferation of nuclear, chemical, and biological weapons and their means of delivery, with a particular focus on non-state actors. Among the more than 200 obligations of UN Security Council Resolution 1540, which I'll refer to as 1540-all legally binding on all states- the Security Council decided that states shall develop and maintain controls over the export of items related to nuclear, chemical, and biological weapons, and their means of delivery including controls regarding the end users of such items. The resolution extends such controls to include transshipments, transits, and re-exports as well as controls such on financing, transport, and other

services supporting such transactions. Generally, the resolution leaves how to implement such controls to national discretion. The resolution for example only recommends that states develop effective national control lists. Although the resolution does not contain a list of the items to control, it defines such items as materials, equipment, and technology covered by relevant multilateral treaties and arrangements or included on national control lists.

The resolution also reflects an understanding that many states would need help in implementing their obligations including on export controls and encourages member States to offer assistance. There is an enormous amount of work, as you can imagine, that still remains to be done to help the international community fully implement the resolution including in the field that we are discussing today on export controls.

So, now I'll turn briefly to the EXBS Program. The United States provides assistance to over 60 countries in the development of their export controls and border security capabilities through the State Department's Export Control and Related Border Security Program (EXBS). EXBS draws upon the expertise of US



government agencies, foreign government experts, the private sector, and the academic community to organize over 200 specialized capacity building activities to improve export controls and border security in five core areas.

First: development of comprehensive legal/regulatory frameworks to regulate trade and proliferation-sensitive dual-use items and enforcement of those laws. To give you a flavor of what that looks like in practice, for instance, EXBS efforts led most recently to the adoption of new legislation in Tajikistan. In 2014, EXBS support contributed to passage of new export control laws in Serbia. EXBS is currently working in Afghanistan, Kenya, Morocco, Mongolia, and the Philippines among others, on the development of their draft Strategic Trade Control Legislation. So you can see the broad, global reach of our engagement.

Second: establishment of effective licensing procedures and practices that apply to export, transit, transshipment, brokering, and financing transactions involving controlled goods. For example, last year in June, EXBS supported a study visit for the Thai Licensing Officials to South Korea to learn more about the Republic of Korea's Licensing Systems Called "YesTrade". Such exchanges promote regional harmonization of Strategic Trade Control Best Practices and facilitate development of peer-to-peer networks among nonproliferation practitioners.

Third: EXBS supports activities that bolster partner governments' outreach to their strategic industry sectors including exporters, freight forwarders, and shippers that are important partners for us. For example, in 2014, EXBS facilitated a two-day outreach workshop with Armenian industry and government to discuss proliferation risks facing Armenia and illustrate the need for and value of internal compliance best practices for Armenian exporters of dual use goods. The event resulted in the Armenian Ministry of Economy's policy guidance on

Internal Compliance Programs (ICPs) to be published this year.

Fourth: strengthening enforcement at and between points of entry on the border. EXBS provides training on detection, inspection, interdiction, and disposal of controlled items as well as investigation, and prosecution of violations. EXBS also donates state-of-the-art detection and inspection equipment to partner governments. For example, EXBS is strengthening the capacity of Syria's neighbors to stop illicit transfers by training front line border security officials to identify dual-use weapons of mass destruction components in Turkey, Jordan, and Lebanon. In this area, EXBS also works with international organizations such as the World Customs Organization to encourage adoption of better enforcement practices including automated advance manifest, data collection, and automated targeting.

Finally, EXBS supports activities to facilitate inter-agency cooperation, information sharing, and international collaboration among partner nations. Our last international export control conference was held in Dubai, UAE in March 2014. The event brought together 313 participants from 74 countries. To illustrate the benefits of international cooperation EXBS joins efforts with other international donors. For instance, Georgia's 2014 law on the control of military and dual-use products is the result of a 5 year joint effort between EXBS and the EU's Outreach Program on Dual-use Goods. EXBS assistance helps improve decision making on dual-use transfer requests, harmonize national export control systems with international standards, and reduce the risk of illicit trade and trafficking in WMD and related materials. By strengthening regional, sub-regional, and national capacities, EXBS assistance contributes to the effective implementation of 1540.

The impact of EXBS assistance is evident. Since 2004, the 1540 Committee has issued several reports documenting measures taken by states to implement

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their export control obligations. It has found that many authorities have established or altered their control systems to reflect their obligations under 1540. Among those are many EXBS partners, including: Armenia, Georgia, India, Jordan, Kosovo, Malaysia, Mexico, Serbia, Thailand, and the United Arab Emirates.

1540 Compass: What are the challenges of ensuring that the results of this assistance - the institutional and normative changes in target countries - become self-sustaining? What kinds of strategies are being developed to overcome these challenges? Can you provide some examples of where changes have become self-sustaining?

Limage: So, the challenge of sustainability is a very important one we address both internally in Washington as we develop this outreach and in the field when we engage with our partner countries. In Washington, the EXBS Program that I oversee includes an inter-agency coordination arm, or the inter-agency working group. There's a working level that's run by the director of the EXBS Program and a senior level that I run on a regular basis, which brings together all agencies and components within the US government that provide strategic trade control assistance funding. We get together and focus on countries and regions where that assistance is necessary and ensure that assistance is going to be sustainable and de-conflicted when we happen to work in the same places. In the field, we work closely with our partners to make sure that the assistance we provide is sustainable. So, EXBS for example, tends to provide both equipment that is practical and simple to use, as well as skills that are highly transferable to the relevant agencies that monitor the border and deal with the movement of dual-use goods. Now, sustainability is also directly related to political will. A government has to want to prioritize the focus on the development of strategic trade control regulations as well as their effective implementation. We've noticed that if we provide very basic training and equipment as well as legal regulatory workshops that help develop those strategic trade controls, we are able to leave a lasting impression on a country.

The last thing that I'll say is the EXBS Program has a very strong focus on its mission. It begins with a gap assessment of the areas that need improvement within its mandate, then focuses on building up the

capacity of the five areas that I've described, and then does what does not always happen - it leaves a country. The program graduates the country that it was working with and changes the relationship from a partner country, where we were providing assistance, to a country that stands on its own and trains, equips, and works with regional partners that are still seeking to develop strategic trade controls. In terms of the challenges of adopting strategic trade controls themselves, there is always a concern among countries that they're not familiar with strategic trade controls and the impact that those controls will have on lawful commerce. Part of our mission is essentially an educational mission, where we explain and describe to countries the benefits of adopting strategic trade controls in terms of making countries better investment destinations and improving the business climate in those countries because often other countries will want to know what that security climate is before exporting dual-use items.

1540 Compass: In many developing nations it could be argued that the fulfillment of UNSCR 1540 responsibilities is not the highest priority for governments which do not perceive their countries as part of the "problem", they are not high-technology holders or suppliers, which have more pressing national concerns such as general governance, poverty, hunger, and security, and which have limited government resources. What strategies is your office using to convince these nations that implementation of UNSCR 1540 should be a priority and to possibly simplify and coordinate reporting requirements for UNSCR 1540 and other international conventions? Such countries often will say we don't have enough people in the government to respond to the CWC, the NPT, etc.

Limage: The conversation often begins with a reminder that the 1540 resolution is a universal mandate upon the member states of the United Nations, and so, it's not a US focused imperative but is certainly an obligation a country has undertaken in the context of the United Nations in adopting and enforcing a global norm. Now you're exactly right that to implement all the various provisions within 1540, there are often resource implications but also equally important in my mind a political decision that this in fact matters among the issues that we care about. There are security reasons to implement 1540 to ensure that a country, for example, which may contain deadly





pathogens has the ability to secure them and perhaps safely eliminate them. One other program that I oversee is the State Department's bio-engagement program, which works very closely on developing biosafety and biosecurity practices within countries that have deadly stocks of pathogens. That program was evident and effective in West Africa in the latest Ebola crisis working with law enforcement and other constituencies in West Africa to help them address this deadly problem. 1540 also encourages, but does not promise, assistance from donor countries meeting these requirements. The program that I've discussed with you today, the EXBS Program, provides assistance either bilaterally to countries providing equipment donation or training or indirectly through experts that we hire to provide that assistance and training to help uplift a country in a particular area. Ultimately, in the area of strategic trade controls, there is this business/commerce benefit we see in the development of a predictable business climate and effective strategic trade controls. It's no coincidence that two growing economies, Singapore and Malaysia, have found it important to adopt strategic trade controls in the ASEAN region. There is still an enormous amount

of work to do with other ASEAN member states that would like to have the same economic benefits, and we are still finding ways to address concerns they may have with the impact on the security imperative. Our program is there to work with countries to address those concerns in an effective way.

1540 Compass: Much of the international outreach and capacity building for UNSCR 1540 has been funded by the United States Government (USG). What do you think the role of other countries should be to further the goals of 1540 in the areas of funding and outreach? The USG often provides funding to organizations in other countries (e.g. organizations in the EU) for outreach activities, however, the EU and other foreign governments do not typically fund US organizations for such activities. Do you think such an arrangement is fair and have you discussed it with your international partners?

Limage: I think there are certainly a lot of obligations under 1540, and there certainly are not enough resources in the US government to assist every country that might have a need to implement



those obligations. There are a number of countries that provide assistance to others in the field of nonproliferation, and we work very closely with Canada, Germany, the UK, and others to ensure that we are addressing some of those requirements and meeting some of those requests. In terms of your comment and question about the European Union, there are so many needs in this area under 1540 that we see it as a net positive for the European Union to fund projects related to fulfillment of 1540 in any way they decide to do so. They have very developed expertise and the capacity and the resources to do so whether through their own Centers of Excellence or through bilateral instruments. So we welcome that assistance.

1540 Compass: Are the current reforms of US Export Controls likely to affect the pace or the magnitude or the direction of US assistance to promote UNSCR 1540? Do you think that the lack of an export control law in the US impedes our outreach activities for UNSCR 1540?

Limage: There is no relation between the domestic reform efforts and the assistance provisions we provide other than we are demonstrating to the international community that we take export controls seriously and that we are willing to look at our systems and improve them.

1540 Compass: The Nuclear Security Summits (NSS) have been successful in re-focusing global attention on practical ways of promoting security of nuclear materials. UNSCR 1540 and your office (the ISN Bureau), however, have a wider focus - security of materials and technologies (tangible and intangible) throughout the supply chain. Do you see a need to, and the feasibility of, expanding the ambit of NSS dialogues in line with these foci?

Limage: The president announced what we expect to be the last Nuclear Security Summit. So, while the international community has benefited from the heightened focus that you've described, the nuclear summit process has brought to nonproliferation efforts, it is critical that we continue a strong focus on institutional mechanisms that promote nonproliferation. In parallel, supported by the Nuclear Security Summit are existing assistance relationships and work that the State Department, the Department of Energy, the Department of Defense and other

agencies do in the field of nonproliferation that will continue, I hope, long after the summit process is over. So, I think for me it is simply maintaining a strong focus on those assistance mechanisms as well as resourcing them so that they continue to be effective and can learn off each other.

1540 Compass: We talked earlier about UNSCR 1540 not having an explicit control list, which come from the multilateral regimes. Has your office been thinking about new technologies that aren't covered by the control lists and how they're going to affect nonproliferation? People often talk about 3-D Printing whereby now we don't have source countries versus recipient countries. Has that been something your group has been looking at?

Limage: It is and I think that the US inter-agency has seized on these technical and technological developments that might affect the effectiveness of the measures you put in place to control the export of dual-use items. It is something that we constantly keep an eye on, but it is an inter-agency challenge because the expertise that focuses on those issues is so broad and covers multiple agencies, so we continue to monitor developments that may affect those.

1540 Compass: Well thank you very much for your time this afternoon, Deputy Assistant Secretary of State Simon Limage.

Simon Limage is the Deputy Assistant Secretary for Nonproliferation Programs at the State Department's Bureau of International Security and Nonproliferation. As such he oversees the State Department's Nonproliferation Assistance Programs which includes the Cooperative Threat Reductions Program, the EXBS Program, the Nonproliferation Disarmament Fund which is an important nonproliferation contingency fund, and the Weapons of Mass Destruction and Terrorism Assistance Program.





UN Security Council Resolution 1540: Towards a Strengthened Program of Work for the Mitigation of CBRN Risks

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In view of the various consultations and operational-level activity that have been carried out in connection with UN Security Council resolution 1540 (2004), it is perhaps time to revisit the mandate and capacity of the 1540 Committee vis-à-vis its institutional partners, as well as in terms of the broader current international peace- and security-related priorities of governments. This essay suggests some themes that could contribute to the development of a medium-term program of work that supports efforts to mitigate chemical, biological, radiological, and nuclear risks and build capacity within the 1540 legal framework.

States have many options for implementing their obligations under this resolution and have supported each other in doing so—even though much of this activity remains poorly understood in the wider international community. Any program of work must reflect the technical capacity and resources of the 1540 Committee while avoiding duplication of work by others.

Such work should also take into account the capacities and mandates of the relevant actors, including political and structural factors. States will always differ in terms of their security concerns and priorities. In particular, the sending and receiving of political signals by governments to support preferred views and outcomes, along with their normal practice of linking political and technical questions in order to obstruct or promote policy objectives, will continue to affect how the 1540 Committee functions (including its perceived utility and relevance). This is despite the fact that there can be little if any disagreement about the resolution's overarching purpose. Consequently, operational-level capacity-building activity is arguably more achievable and less vulnerable to the fallout from higher-level political disagreements.

The 1540 Committee encourages states to implement the resolution partly through the development of a reporting matrix (using information provided by governments) that indicates whether a state has taken a relevant measure in accordance with the associated legal or executive measures. Such national reporting provides a basis for bilateral, regional, and international outreach and capacity-building. The Committee also acts as a platform for exchanges of views, including matching offers with requests for assistance, and for broader strategic consultations

¹ *The views expressed are the author's and do not necessarily reflect those of SIPRI.*



among governments and institutional partners. By its very nature, such activity inevitably tends to be somewhat disorganized and unfocused. However, the political processes and programmatic activity should ideally be directed towards constructive ends with overall beneficial outcomes.

An overarching basis for outreach and capacity-building to reduce CBRN-related risks over the medium term is the consideration of best international practices and lessons learned from the Committee's current matrix-based management and planning systems. For example, the Committee could further consider the structure, objectives, and practices of the EU CBRN Centers of Excellence (COE) initiative, which seeks to mitigate and prepare against risks related to CBRN materials and agents on a worldwide yet decentralized and regional basis. This initiative, which is about to begin implementing its 47th project, offers a model for comparing how disparate perceptions and priorities of states and partners can be managed and synchronized towards common political and technical objectives.

EU COE documentation offers a useful basis for comparing and contrasting how project goals are agreed upon and evaluated against the overarching policy objectives. The COE initiative and the 1540 framework face similar challenges, including (a) establishing and maintaining effective networks, (b) tailoring programs based on needs assessments, (c) ensuring a coherent institutional capacity-building strategy at the regional and national levels, and (d) maintaining the longer-term coherence and relevance of programmatic activity. The COE initiative process of synchronizing and managing agreed strategic goals can be compared and contrasted against the 1540 matrix reporting system, and significant differences and lessons can undoubtedly be identified.

The greatest ambiguity in the field of the mitigation

States have many options for implementing their obligations under this resolution and have supported each other in doing so—even though much of this activity remains poorly understood in the wider international community.

of CBRN risks is ensuring that the life sciences are not used for hostile purposes. Codes of conduct and awareness-raising through education outreach have been major international policy themes for strengthening oversight of the life sciences. Control over synthetic biology-related developments, including gene-segment synthesis and oversight of some double-stranded DNA segments, has also been considered. Established in 2009, the International Gene Synthesis Consortium, currently composed of seven partners responsible for approximately 80 percent of international commercial gene synthesis, implements screening procedures against such potential misuse. The National Science Advisory Board for Biosecurity (NSABB), which is managed and supported by the U.S. National Institutes of Health, has identified seven dual-use research characteristics of concern, such as reconstituting an eradicated or extinct biological agent.

Since 2014 the NSABB has focused on gain-of-function (GOF) research, which it defines as “certain studies that increase the ability of a pathogen to cause disease.” On May 5, 2015, the board approved guidance for conducting risk and benefit assessments of GOF research. The United States will pay an independent contractor to perform a risk and benefit analysis of GOF research involving pathogens with pandemic potential. On this basis, the NSABB is tasked to deliver: (a) advice on the design, development, and conduct of risk and benefit assessments, and (b) formal recommendations on the conceptual approach to the evaluation of proposed GOF studies.

As background, on February 2015, Sir Richard Roberts (the chief scientific officer at New England Biolabs) and Dr. David Relman (co-director of Stanford University's Center for International Security and Cooperation and a professor in the university's departments of Medicine and Microbiology & Immunology) wrote an open letter to NSABB chairman Samuel L. Stanley.



The letter underlines the need to take into account the views of vaccine developers and manufacturers, and the views of non-U.S. actors. Many questions suggest themselves, including: How are pros and cons weighed during GOF-related discussions? What are the views of major international life-sciences actors? What would NSABB's response be if the vaccine community is generally favorable to GOF? If vaccine developers and manufacturers (U.S. or otherwise) are unfavorable to GOF restrictions, how might their views be used to support the current opposition to GOF? Would such opposition strengthen the impetus for GOF-based oversight or have a negligible effect?

This theme will probably become more prominent in the context of strategic trade controls, while GOF policy analysis projects will almost certainly continue in the lead-up to the Eighth Review Conference to the 1972 Biological and Toxin Weapons Convention in 2016. It is therefore worth considering mechanisms whereby governments can comment and exchange views on GOF study designs, share relevant risk- and benefit-assessment methodologies, and suggest strategies and policy priorities that could be incorporated into the 1540 matrix system as a basis for strengthening risk assessment and outreach and consultation activity. Such an exercise could also draw on relevant state and private-sector methodologies, including those used in health-care cost-benefit delivery assessments, and social and economic impact evaluations.

Finally, any medium-term program of work that encompasses the aforementioned points would support and strengthen the legal framework's cohesion, purpose, and relevance. Such efforts, then, are worthwhile on many levels.



New Tools for Legislative Implementation of UNSCR 1540: The Legislative Guide to National Implementation of UN Security Council Resolution 1540 (2004) and the National Legislation Implementation Kit on Nuclear Security

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VERTIC finalized two new tools for legislative implementation of UN Security Council resolution 1540 in early 2014: a Legislative Guide to National Implementation of UN Security Council Resolution 1540 (2004) and a National Legislation Implementation Kit on Nuclear Security. These new tools—along with VERTIC’s Sample Act for National Implementation of the 1972 Biological and Toxin Weapons Convention and Related Requirements of UN Security Council Resolution 1540 and the OPCW’s National Legislation Implementation Kit for the Chemical Weapons Convention—now form a complete package to assist states in implementing their obligations, through domestic legislation, under the Biological Weapons Convention (BWC), Chemical Weapons Convention, certain international instruments relating to nuclear security and, of course, UNSCR 1540.

We have been sharing and using these new tools for the past year in our outreach and assistance activities with several states. We wish to bring them to the attention of other states that are looking for a useful reference such as the Legislative Guide to National Implementation of UN Security Council Resolution 1540 (2004) regarding implementation of the resolution through a legal framework, and to the attention of those states

that have not been involved with the Nuclear Security Summits and, therefore, may be unfamiliar with the National Legislation Implementation Kit on Nuclear Security. We also wish to share these documents with other assistance providers and civil-society actors who may find the documents useful references in their own outreach and assistance activities.

We particularly encourage the 1540 Committee and its experts to consider these two new documents as examples of best practices during their conduct of the Comprehensive Review of the Status of Implementation of Resolution 1540 in 2016. Toward the objectives above, this article gives an overview of the development and content of VERTIC’s two new legislative assistance tools.

Legislative Guide to National Implementation of UN Security Council Resolution 1540 (2004)

VERTIC developed the Legislative Guide to National Implementation of UN Security Council Resolution 1540 (2004) (1540 Legislative Guide) to serve as a useful reference for states when they are engaged in the process of implementing UNSCR 1540 through domestic legislation. The 1540 Legislative Guide accordingly identifies and organizes in one document the model laws, implementation kits, and handbooks that have already been developed by the IAEA, OPCW, VERTIC, and other legislative assistance providers to assist states in implementing the international legal instruments to prohibit and prevent the proliferation

of biological, chemical, and nuclear weapons and related materials.

The 1540 Legislative Guide was published shortly after submission of the National Legislation Implementation Kit on Nuclear Security (NLIK or Kit) to the Nuclear Security Summit in The Hague in March 2014 (discussed below). Since the 1540 Legislative Guide's publication, the permanent representatives of Canada and the United Kingdom to the United Nations in New York have presented it by letter to the UN Security Council, on October 20, 2014, and to the 1540 Committee at its 62nd formal meeting, on November 3, 2014. More recently, on 28 April 2015, the 1540 Legislative Guide and the NLIK, as well as VERTIC's Sample Act for National Implementation of the 1972 Biological and Toxin Weapons Convention and Related Requirements of UN Security Council Resolution 1540, were submitted to the 1540 Committee by the UK Mission to the United Nations as examples of "best practice" for legislative implementation of UNSCR 1540. The 1540 Legislative Guide was made possible by financial support from Canada (through the Global Partnership Program) and the United Kingdom (the Strategic Program Fund), and is now available on the VERTIC website in Arabic, Chinese, English, French, Portuguese, Russian, and Spanish.

The 1540 Legislative Guide is divided into five parts. The first part is the Introduction, which gives an overview of the resolution; the 1540 Committee and its Group of Experts; and the types of assistance that are available for the legislative implementation of UNSCR 1540. The second part of the 1540 Legislative Guide focuses on national implementation of the BWC and the biological-weapons-related provisions of UNSCR 1540, and provides short descriptions of VERTIC's Sample Act for National Implementation of the 1972 Biological and Toxin Weapons Convention and Related Requirements of UN Security Council Resolution 1540, the Regulatory Guidelines for National Implementation of the 1972 Biological and Toxin Weapons Convention and Related Requirements of UN Security Council Resolution 1540, and the ICRC-VERTIC Model Law—The Biological and Toxin Weapons Crimes Act.

The third part of the 1540 Legislative Guide focuses on national implementation of the CWC and the chemical-weapons-related provisions of UNSCR

1540, and provides a short description of the OPCW's National Legislation Implementation Kit for the Chemical Weapons Convention. The fourth part of the 1540 Legislative Guide gives an overview of IAEA and VERTIC documentation on legislative measures for the prohibition and prevention of the proliferation of nuclear weapons and related material under UNSCR 1540. Accordingly, there are short descriptions of certain publications in the IAEA's Nuclear Security Series; other IAEA documents on national implementation, such as the 2003 and 2010 Handbooks on Nuclear Law; and the Indonesia-VERTIC National Legislation Implementation Kit on Nuclear Security, discussed below.

Finally, the fifth part of the 1540 Legislative Guide gives short descriptions of other international legal instruments that may have some relevance to legislative implementation of UNSCR 1540, such as the World Health Organization's International Health Regulations and the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal.

National Legislation Implementation Kit on Nuclear Security

A National Legislation Implementation Kit on Nuclear Security was originally proposed by the government of Indonesia as a so-called house gift to the 2012 Nuclear Security Summit in Seoul, South Korea. President Yudhoyono threw his support behind the NLIK in Indonesia's national statement to the summit. Indonesia was then joined by 25 countries in a joint statement that would lay the basis for development of the NLIK between the 2012 Seoul Summit and the 2014 summit in The Hague. The joint statement suggested that the NLIK would "provide States with references to a wide array of consolidated elements and provisions from different nuclear security conventions/treaties, as well as international legal instruments and frameworks."

Indonesia observed in a related "non-paper" submitted before the Seoul Summit that developing nuclear security legislation involves "many international legal instruments and frameworks in nuclear security that exist under the aegis of the UN, IAEA and other international organizations," and that some of these instruments are legally binding while others are voluntary. Jakarta gave an indication of which



international legal instruments it foresaw as being included in the NLIK and described its objectives as:

- Providing states with a national legislation implementation kit to help them develop more comprehensive national legislation on nuclear security
- Providing states with a reference in nuclear security that consolidates elements and provisions from different conventions and treaties, international legal instruments, and frameworks pertaining to nuclear security

Two actions were recommended in the non-paper to meet these objectives:

- Before the 2012 summit, “consolidate all relevant instruments and frameworks and present them as a single and friendly reference encompassing all provisions and elements that need to be reflected in national legislation on nuclear security”
- After the 2012 summit, finalize the Kit for use by “any State to self-assess its own existing legislation(s) related to nuclear security”

At the government of Indonesia’s request, VERTIC agreed in early 2013 to work on developing the NLIK. The Kit was informed by the two objectives above, modified as follows:

- To help states develop comprehensive national legislation on nuclear security, in accordance with their own respective legal cultures and internal legal processes
- To provide states with references to a wide array of consolidated elements and provisions contained in relevant international legal instruments and guidance documents that together establish the global framework for nuclear security

The process of developing the NLIK involved a number of drafts which were presented to Indonesia’s Sherpa for the 2014 NSS, Ambassador Hasan Kleib, the director-general for multilateral affairs in Indonesia’s Foreign Ministry, who in turn circulated the drafts among interested governments and international organizations for comment. In

the meanwhile, progress on the NLIK was noted in Indonesia’s national statement to the IAEA Nuclear Security Conference in July 2013, given by Ambassador Kleib, and discussed at an expert meeting on the NLIK organized by the Indonesian government in Yogyakarta from November 20-21, 2013.

This meeting had the aim of introducing the Kit to all NSS participants before its official submission by the government of Indonesia to the 2014 summit in The Hague. To build wider ownership of the Kit, all participants, hailing from 35 countries around the world, were invited to give their inputs on the Kit. Experts from international and regional organizations, including the IAEA, the UN Office on Drugs and Crime, the Comprehensive Nuclear-Test-Ban Treaty Organization, and ASEAN, also gave their views on the Kit, which was subsequently revised after the meeting. The Kit was considered further at the so-called “Gift Basket Information Market” during a meeting for NSS Sherpas in Pattaya, Thailand, from January 13-14, 2014. It was also discussed in a joint report by the Arms Control Association and the Partnership for Global Security, *The Nuclear Security Summit: Assessment of Joint Statements*, released a couple of weeks before the NSS in The Hague.

Vice-President Boediono presented the Kit to the NSS in The Hague on March 25, 2014. Twenty-nine summit nations from all regions of the world, along with the United Nations, supported the Joint Statement on the National Legislation Implementation Kit on Nuclear Security, confirming that the Kit “provides States with references to a wide array of consolidated elements and provisions contained in relevant international legal instruments and guidance documents on nuclear security that together contribute to the global framework for nuclear security.” In Paragraph 11 of the Hague Communiqué—the final document from the summit—the participating states “welcome[d] efforts aimed at developing model legislation on nuclear security, which could provide States with building blocks to develop comprehensive national legislation in accordance with their own legal systems and internal legal processes.”

On May 7, 2014, Ambassador Lyall Grant of the U.K. Mission to the United Nations highlighted the NLIK in his speech to the UN Security Council, during an open debate to commemorate the tenth anniversary of UNSCR 1540. He noted that the United Kingdom’s



Counter-proliferation Strategic Program Fund had enabled the United Kingdom to “collaborate with Canada and Indonesia to produce a Nuclear Security National Legislation Implementation Kit. We hope that other states find this kit useful in ensuring their domestic legislation is in line with the requirements of Resolution 1540.”

The Kit presented to the NSS in The Hague is now available in Arabic, Chinese, English, French, Portuguese, Russian, and Spanish. It includes a useful description of the process for developing nuclear-security legislation, as well as a Model Law. The latter sets forth an overview, elucidating its objectives, scope, and a description of its sections. The Model Law defines its terms before delving into provisions for:

- National regulation of nuclear security, including the establishment of a competent authority
- Physical protection and security of nuclear and other radioactive materials and nuclear facilities
- Security of radioactive sources
- Notification about incidents
- Transport, import, export, and transit of nuclear material and radioactive sources
- Offenses and penalties
- Jurisdiction
- Criminal proceedings and international cooperation

The following international instruments are covered by the Model Law:

- Convention on the Physical Protection of Nuclear Material (1980) and the convention’s Amendment (2005)
- International Convention for the Suppression of Acts of Nuclear Terrorism (2005)
- Code of Conduct on the Safety and Security of Radioactive Sources (2003) and Guidance on the Import and Export of Radioactive Sources (2012)
- Convention on the Suppression of Unlawful Acts Relating to International Civil Aviation (2010)
- Convention for the Suppression of Unlawful Acts against the Safety of Maritime Navigation (1988), as amended by the 2005 Protocol
- Protocol for the Suppression of Unlawful Acts against the Safety of Fixed Platforms Located on the Continental Shelf (1988), as amended by the 2005 Protocol

VERTIC’s National Implementation Measures (NIM) Program is engaged in a multi-year nuclear security legislation project, which includes reviewing and analyzing states’ existing legal and regulatory frameworks for the implementation of the nuclear security related aspects of the legal instruments noted above. The NIM Program’s staff is also providing legislative assistance to states using the Model Law in the NLIK. This complements our legislative assistance offer for national implementation of the obligations under the BWC and CWC and related provisions of UNSCR 1540.

For more information about the Legislative Guide to National Implementation of UN Security Council Resolution 1540 (2004) or National Legislation Implementation Kit on Nuclear Security, please contact Scott Spence, program director for national implementation at VERTIC (scott.spence@vertic.org).



Toward a New International Norm: Effective Security for Military Nuclear Materials

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The phrase “nuclear security” has received global attention over the past quarter-century, but few would agree on its meaning. The Obama administration has made nuclear security a focus of its foreign policy, initiating a series of multinational summits on the topic beginning in 2010. The final Nuclear Security Summit will convene in Chicago in the spring of 2016. In the time leading up to the summit, national delegations, nongovernmental organizations, and civil-society groups are preparing the agenda and striving to achieve specific nuclear-security goals or commitments that can be announced during the summit proceedings.

The goal of the NSS process is to address the threat of nuclear terrorism by enhancing international cooperation to prevent the illicit acquisition of nuclear materials by nonstate actors such as terrorist groups and smugglers. So far the NSS process has concentrated on the challenge of implementing the highest standards of security for weapons-usable nuclear materials (plutonium and highly enriched uranium (HEU)) in civil programs throughout the world.

This is a commendable goal, and much progress has been made in terms of reducing the number of nations that possess such materials. In turning, cutting the number of possessors strengthens security for remaining stocks and hastens progress toward the goal of ending the civil use of HEU globally. However, weapons-usable nuclear material in civil programs represents only a small fraction of the world inventory of these materials. Eighty-five percent of such materials are in the military programs of states possessing nuclear weapons. Global nuclear security efforts cannot be effective unless they ensure that all military nuclear materials are secure from unauthorized access

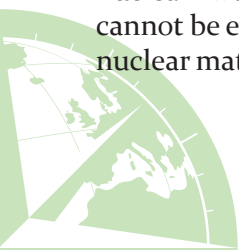
and theft and that nuclear facilities are secure from sabotage.

Building a New Norm

It is past time that international law and custom expand to cover this diplomatic terra incognita. While states with military nuclear materials generally accept their sovereign responsibility to provide the highest possible levels of security for these materials, no laws obligate them to provide assurances to the international community that they are doing so appropriately and effectively. This critical gap in the world’s nuclear-security architecture needs to be closed immediately.

Why should states with nuclear-weapons programs feel it is in their interest to provide confidence to the rest of the world that their nuclear weapons and materials are secure? After all it is possible that any public disclosure of the systems and practices used to secure these materials could provide advantages to adversaries trying to steal or attack them. This concern, however legitimate, must be weighed against the international-security benefits of accepting accountability and providing concrete assurances that the utmost efforts are being taken to secure nuclear materials in military programs. At least three such benefits stand out.

First, because any nuclear detonation or major act of sabotage would have consequences for the entire international community, states that possess nuclear weapons and weapons-usable nuclear materials should accept *prima facie* responsibility to assure the international community that they are adequately protecting these items from theft or sabotage. Failure to fulfill this responsibility is an affront to the security of the international community and undermines existing obligations under several international legal instruments, including UN Security Council resolution 1540 and the International Convention on the Suppression of Acts of Nuclear Terrorism.





How secure are nuclear weapons?

Moreover, because all nations with military nuclear programs would suffer from a nuclear terrorist incident, it is in their interest to be confident that all such other nations are protecting their nuclear materials effectively.

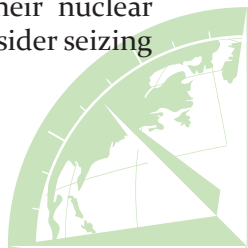
Second, assurances of effective security for military nuclear materials can help reduce motivations for other states to initiate military nuclear programs. Some governments, fearing that their adversaries may obtain nuclear materials clandestinely through theft, may hedge against this possibility by acquiring weapons-usable nuclear materials of their own. Fear of the less likely but not impossible chance that nonstate or rogue actors could conduct a cyber attack that causes the unauthorized use of nuclear weapons might also lead some nations to seek their own nuclear-weapons capabilities for deterrence or retaliation. Without periodic assurances that nuclear weapons are secure and accounted for, suspicions might also arise that a nuclear-armed state might be willing to provide weapons or materials to an ally or for a sufficient price.

Finally, it is in the interest of weapons-possessing states to provide mutual assurances regarding the security of their nuclear weapons and materials, because such exchanges could have vital benefits in the event of an

actual nuclear terrorist event or accident. If weapons-possessing states have been providing information and credible assurances on nuclear security through established channels of communication prior to a nuclear terrorist event, there will be less tension and suspicion and more willingness to cooperate to mitigate the consequences of the event.

For example, if a terrorist nuclear blast occurred in London or Washington, DC and sampling of debris indicated that the nuclear materials originated in Pakistan, the victim might retaliate with military force if it concluded that Islamabad was culpable. Good-faith efforts to enforce high standards of nuclear security, on the other hand, would reduce suspicions that Pakistani complicity or negligence had allowed terrorists to obtain the makings of a bomb. The threat of war would recede.

It is also possible that prior cooperation on military nuclear security could provide states with vital information about threats or early warning of stolen materials. Such exchanges of information could help defeat the threat or capture the perpetrators before they caused major harm. In addition, states that possess military nuclear materials must realize that critical concern over the security of their nuclear materials might lead another state to consider seizing



those materials by force to prevent them from being obtained by nonstate actors during a crisis.

What Can States Do?

The first thing that states with military nuclear materials can do is to accept and strengthen the norm that they should reassure the international community that their materials are secure. This can be done by formalizing and expanding the regime of existing international instruments that cover security for military nuclear materials. These include:

- UN Security Council resolution 1540. UNSCR 1540 requires that all UN member states provide “appropriate effective” security for any stockpiles of nuclear weapons or “related materials” (certainly including fissile materials) they may have. All states with nuclear weapons are UN member states and therefore should demonstrate that their military nuclear materials are under appropriate and effective administrative, legal, and operational control by national authorities.
- The 2014 NSS communiqué reaffirmed “the fundamental responsibility of States, in accordance with their respective obligations, to maintain at all times effective security of all nuclear and other radioactive materials, including nuclear materials used in nuclear weapons.” The 2016 NSS communiqué should reassert this responsibility yet again.
- The 2005 International Convention for the Suppression of Acts of Nuclear Terrorism obligates signatories to take certain actions to protect from and respond to unauthorized use of civilian or military nuclear materials.

The United States included information about its military stocks in its most recent annual UNSCR 1540 report. Other nuclear-weapon-possessing states should follow suit by providing detailed information on their security rules and practices in their 1540 reports. This will help build confidence that states have effective nuclear security, physical protection, and nuclear accounting systems.

States could also provide additional information in their National Progress Reports for the 2016 NSS. In the 2014 NSS U.S. National Statement, several specific examples of measures that increase confidence in

the security of military materials were highlighted, including:

- A statement that the United States secures all military material “in exemplary fashion,” and takes IAEA INFCIRC/225/Rev. 5 into account in the security of its military material.
- Publication of regulations governing security of military material, and of the associated annual budgets.
- Maintenance of human reliability programs for personnel responsible for securing military material.
- Publication of studies and reviews of nuclear security incidents, including lessons learned and actions taken (e.g., the Department of Energy Office of the Inspector General Report on the Y-12 incident).

Such measures could be considered by other states as building blocks to increase confidence in their own military materials. Beyond these steps, states should consider the following specific measures to demonstrate effective security for all nuclear materials—civilian and military—against all plausible threats:

- Verify adequate training of personnel through internationally recognized certification programs.
- Allow third-party inspection of basic physical-protection guidelines and physical-protection systems.
- Declare and demonstrate the ability to meet all potential levels of threat from nonstate actors to military nuclear facilities.
- Declare compliance with UN guidelines on physical protection for storage and transportation of military materials.

Finally, in order to strengthen the norm for security of military nuclear materials, states that possess such materials and are party to the NPT should submit reports on efforts to enhance military nuclear-materials security to the NPT Preparatory Committee sessions and Review Conferences. Furthermore, specific steps to improve the security of



military nuclear materials and provide international assurances to that end could be integrated into the outcome of future NPT Review Conferences, allowing progress on these commitments to be tracked into the future.

All nuclear weapons, weapons-usable materials, and nuclear facilities whose sabotage could cause a major catastrophe must be protected against a set of threats that includes the full spectrum of plausible adversary capabilities. States should commit to a rigorous threat assessment to produce a clear, detailed design basis threat and commit to recommended practices, such as defense in depth. Such threat assessments should not only include information from military or civilian nuclear facilities but also be based on lessons learned from past terrorist and criminal acts against economic, civilian, and military targets.

All nuclear weapons and weapons-usable materials should have accounting and control systems capable of detecting significant theft. These systems should prevent unmonitored access, address insider threats, and use measurement control programs. All facilities with military nuclear materials should have programs in place to assess and improve their staffs' security culture, with a focus on achieving and sustaining effective protection. These programs should seek to develop well-trained and certified security personnel and to instill in these personnel a belief in realistic threats.

In addition, states with military materials should provide assurances that they have effective security, drawing on past cooperative approaches. The history of these cooperative approaches shows it is possible to provide assurances while protecting sensitive information. Part of this cooperation should be to commit to exchange best practices and establish voluntary peer reviews of a bilateral, trilateral, or other nature, or International Physical Protection Advisory Service-type reviews for military materials. States could also promote lab-to-lab personnel visits, including site visits starting from less-sensitive facilities to slowly build trust in the practice.

CONCLUSIONS

These suggested activities are merely examples of actions that could be taken by nuclear-weapon-possessing states to provide assurances that their weapons and materials are secure. These materials represent by far the greatest portion of nuclear-weapons-grade materials in world inventories. All possible forums for international dialogue on this issue should be utilized. For example, the five permanent Security Council members should establish a nuclear-security working group, and one of the participating countries could host an experts meeting on nuclear security for military materials globally. This working group could develop a reporting form on military materials that could be submitted under UNSCR 1540, and its members could engage India, Pakistan, and Israel on the margins of meetings of the UN Disarmament Commission to discuss this undertaking and the broader issue of security of military nuclear materials.

In summary, states with military materials should accept the obligation to secure military materials to the same or higher standards as comparable civilian materials, including through the application of best practices and consistent with the the International Atomic Energy Agency's (IAEA) nuclear-security guidelines. They should also acknowledge that strengthening a global norm to provide concrete assurances to the international community that their weapons and materials are secure is in their own best interest as well—and begin implementing measures that provide such assurances.



Nuclear Security: Risks for Kazakhstan

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INTRODUCTION

Kazakhstan played an important role in the Soviet military-industrial complex. When the Soviet Union collapsed, the newly independent state inherited uranium mining and milling facilities, nuclear research reactors fueled with highly enriched uranium, and test sites for nuclear weapons and their means of delivery. Kazakhstan became home to the fourth-largest nuclear arsenal in the world, with 1,410 nuclear warheads deployed on missiles and heavy bombers. With significant disarmament and nonproliferation assistance from international partners, Kazakhstan transferred, dismantled, and eliminated all of the nuclear weapons systems and facilities and much of the infrastructure left on its territory; signed and ratified major international nonproliferation treaties; and became an active proponent of the international nonproliferation regime.

At present, however, Kazakhstan faces a number of nuclear-security-related risks and challenges. Most importantly, nuclear and radioactive materials remaining in the country need to be properly safeguarded from theft or diversion. In addition to unsolved problems resulting from the Soviet nuclear-weapons program, the country may confront new threats stemming from its decision to develop a national nuclear power industry, including the threat of nuclear and radiological terrorism. There are other potential challenges, such as illicit trafficking in nuclear materials, technologies, and equipment. These risks are exacerbated by the country's insufficiently protected borders, lack of inter-agency cooperation, relatively weak law-enforcement capabilities, and other internal security challenges, as well as transnational organized crime.

Future nuclear-security activities in Kazakhstan should focus on improving nuclear-security systems at nuclear facilities, continuing engagement on the

former Semipalatinsk nuclear test site, countering radiological security threats, enhancing export controls and border security, and strengthening cyber security in the nuclear sector.

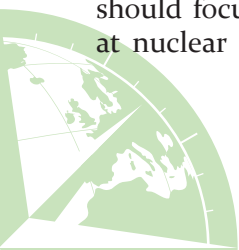
IMPROVING SECURITY AT NUCLEAR FACILITIES

As part of the Nunn-Lugar Cooperative Threat Reduction Program, multiple projects have been implemented in Kazakhstan in such areas as making technological upgrades, improving protection, control, and accounting systems for nuclear and radioactive materials, and strengthening security measures at nuclear industry facilities and nuclear installations. It would seem that all these improvements, along with increased protection of nuclear facilities by law-enforcement agencies, have minimized external threats, including the threat of a direct attack by terrorists.

However, technical weaknesses in the safety and security systems of nuclear facilities, as well as shortcomings in personnel training and emergency response procedures, make these facilities vulnerable not only to natural disasters and emergencies, but also to break-ins, theft, and sabotage. Even if a facility is reliably guarded and equipped with advanced physical-protection systems, human error or greed can lead to security breaches. Experts are now starting to realize the many links connecting nuclear security and safety and the need to improve the security culture.

Thus, there is an obvious need to further modernize security and physical-protection systems at nuclear installations, as well as nuclear-related research centers and industrial facilities in Kazakhstan. Such modernization must include not only introducing more advanced equipment but also increasing the resilience of nuclear facilities in the face of emergencies and terrorist attacks, as well as augmenting the capability of security forces with training and equipment.

With the Kazakhstani government's consent, representatives of international partners, in cooperation with the relevant national authority, could conduct security audits at existing nuclear facilities





in order to estimate the scale and the cost of the required modernization projects. Such inspections must include a comprehensive analysis of procedures, technology, structures, and equipment in order to identify potential loopholes and vulnerabilities, and the development of preventive measures to increase the level of nuclear security.

As part of these activities, an independent international certification of Kazakhstan's nuclear-power-plant construction project could be organized to make sure that it meets all nuclear safety and security standards. International partners could also provide assistance to Kazakhstan by conducting regular training exercises to improve coordination among personnel in case of an incident at a nuclear facility.

To facilitate improvements in the level of security culture in the nuclear industry and to promote interstate sharing of best practices, international partners could help Kazakhstan establish relevant multilayer education programs covering all aspects of nuclear security. It would also be helpful to transform

the training center for accounting, control, and physical protection of nuclear materials established at the Institute of Nuclear Physics into a regional nuclear-security excellence center that offers introductory and advanced professional-development courses for officials from national regulatory agencies and for security personnel working at nuclear facilities in Central Asian countries.

In the longer term, the regional states should work together to adopt more comprehensive, robust, and sustainable approaches to fostering a security culture that encompasses not just the nuclear domain but also chemical, biological, and radiological threats and responses.

CONTINUED INTERNATIONAL ENGAGEMENT AT SEMIPALATINSK

At the Nuclear Security Summit in Seoul in April 2012, the presidents of Kazakhstan, Russia, and the United States made a joint statement to the effect that efforts to eliminate the consequences of Soviet-era nuclear tests at the Semipalatinsk test site were almost complete. It is



certainly true that multilateral cooperation programs have carried out an unprecedented amount of work in the Semipalatinsk area to dismantle nuclear-weapons testing infrastructure and to increase the level of security at facilities under the National Nuclear Center of the Republic of Kazakhstan.

At the same time, there is a clear and pressing need for continued international cooperation at the former test site. First and foremost, a number of sensitive facilities still remain there. Strengthening their security is in the interests of not just Kazakhstan but of its international partners. One of these facilities is the Baikal-1 site, which is currently used as a long-term storage for a significant quantity of nuclear materials and waste generated by the now decommissioned BN-350 fast breeder reactor in Aktau. Furthermore, Kazakhstan plans to use the facility as the core of the proposed new national center for radioactive waste processing and storage. It is also important to maintain a proper level of security at the sealed tunnels and shafts previously used for nuclear-weapons testing.

The Kazakh National Nuclear Center is also currently working on a land-rehabilitation initiative at the former Semipalatinsk test site. Based on the findings of a comprehensive radiological study, the Center believes that up to 90 percent of the land occupied by the site can be returned to economic use in several phases by 2020, with the exception of severely polluted areas and the territories occupied by nuclear facilities still in use. Taking into account the planned scope of work, it would probably be expedient to consider enlisting international experts in implementing this initiative. In particular, they could provide assistance in assessing long-term public-health and environmental consequences of brown-field site reclamation.

COUNTERING RADIOLOGICAL SECURITY THREATS

In recent years radiological security issues have come to be regarded as part of the general nuclear-security agenda. Given the growing risks and threats associated with possible radiation accidents, lax security of radiation sources, and the danger of their use by terrorists, radiological security is becoming a subject of growing international concern. After the breakup of the Soviet Union, the Kazakhstani government lost control of some of the radiation sources used for

military, industrial, medical, and research purposes. These sources contain highly radioactive materials, including cesium-137, strontium-90, cobalt-60, and iridium-192.

According to some reports, a certain amount of radioactive sources and materials was buried in Central Asia's numerous uranium tailings and other radioactive-waste storage sites. Unlike the nuclear facilities, these tailings and waste storage sites are not properly guarded and protected. If highly radioactive materials from these sites fell into the wrong hands, they could be used to build a radiological dispersal device, or a so-called dirty bomb. That is one of the region's most serious security risks related to WMD terrorism.

While dirty bombs do not have the capability to inflict mass casualties or serious destruction, they can cause radioactive contamination of large territories, leading to public-health risks and lost economic opportunities. An attack using a radiological dispersal device would also have a tremendous psychological impact on the population in and around the affected areas. In addition, radical opponents of nuclear-energy development could cite the risk of a terrorist attack using radioactive materials to mobilize public opinion against future nuclear projects. Evidence suggests that it is very easy to form negative perceptions of any nuclear-related initiative among the general public in the country, primarily due to a high level of radiophobia.

The risk of a dirty-bomb attack is fairly high, due to the relatively easy availability of radioactive materials and the simplicity of dirty-bomb designs. Furthermore, sources of radiation can be very small and compact, making them easy to transport and smuggle across the borders. That necessitates close cooperation among Kazakhstan and international partners in ensuring the timely detection and interdiction of radioactive contraband, including in equipping border crossings and other strategic locations with radiation detectors.

On the national level, the government must take further steps to strengthen the legislative and regulatory framework for the registration and use of radioactive materials, including the introduction of modern registration and accounting systems that track all radiation sources throughout their operational lifetimes. The government must also



introduce harsher penalties for theft or improper use of radiation sources that continue to be widely used in many legitimate areas, including healthcare, research, industry, and agriculture. The relevant government agencies should organize regular operations to locate, secure, and dispose of orphan or decommissioned sources; build special storage facilities; and upgrade physical-protection systems at the existing sites.

ENHANCING EXPORT CONTROLS AND BORDER SECURITY

Another potential threat is the possibility of Kazakhstan's being used as a transit route for illicit transfers of nuclear and other WMD-related materials, technologies, and equipment. The trafficking routes can be largely the same as the ones used to smuggle drugs out of Afghanistan through Eurasia to Europe. But illicit activities can also be disguised as legal commercial operations, with sensitive equipment and technologies, dual-use products, and fissile materials being purchased by front companies or brokerages.

To date, there have been no confirmed cases of highly enriched uranium or weapons-grade plutonium being smuggled via Central Asia. However, the regional authorities have registered numerous cases where cargo containing radiation sources or radioactive scrap metal were interdicted. Paradoxically, the Eurasian Economic Union comprised of Belarus, Kazakhstan, and Russia, while facilitating free trade of goods across borders, could also create opportunities for increased transnational crime, including trafficking activities, by removing customs controls on the Union's internal borders.

Although much progress has been achieved in securing and guarding the national borders in Central

Another potential threat is the possibility of Kazakhstan's being used as a transit route for illicit transfers of nuclear and other WMD-related materials, technologies, and equipment. The trafficking routes can be largely the same as the ones used to smuggle drugs out of Afghanistan through Eurasia to Europe.

Asia, Kazakhstan must actively cooperate with its regional neighbors and international partners in order to be able to respond effectively to all these threats. It would be appropriate and practical to build on the existing cooperation experience accumulated during the implementation of U.S.- and EU-initiated assistance programs, such as Export Control and Border Security, Second Line of Defense, and Border Management in Central Asia.

The country's law-enforcement, intelligence, and security services should pursue more active cooperation and information exchange with their foreign counterparts. Kazakhstan and the Central Asian countries should also continue the practice of joint anti-terrorism exercises not only in the frameworks of the Collective Security Treaty Organization or the Shanghai Cooperation Organization, but also on bilateral and regional bases. Overall, the Central Asian states would benefit from greater assistance in implementing UNSCR 1540, which aims to prevent WMD from falling into the hands

of nonstate actors. In addition, the countries of the region should fully utilize the potential of the Central Asian Nuclear-Weapon-Free Zone, the only regional security initiative that includes all five post-Soviet Central Asian states.

STRENGTHENING CYBER SECURITY IN THE NUCLEAR SECTOR

Cyber security issues are now coming to the fore in the context of international and national security. The growing number of cyber attacks against government agencies, diplomatic missions, companies, and research institutions all over the world emphasizes the urgent need for improved protection of information infrastructure and resources from criminals, hackers, and other attackers trying to gain unauthorized



access.

All of this fully applies to Kazakhstan as well. Cyber security in the nuclear sector is especially important due to this field's obvious sensitivity and potential dangers should the integrity of IT systems be lost at nuclear facilities. Targeted cyber attacks by hostile foreign governments or nonstate actors can also lead to the leakage of sensitive information, technologies, and expertise required for the manufacture or use of nuclear materials. Due to the rapid pace of IT development, existing national-security standards and practices often lag behind the constantly evolving cyber threats.

This is why there should be a greater focus on cyber security in Kazakhstan, which is pursuing ambitious nuclear-industry development plans, including NPP construction. Kazakhstan's vulnerabilities are well known. In January 2013, for instance, the country had one of the highest numbers of computers infected by the Red October cyber espionage malware, which was discovered by the Kaspersky Lab, a cyber security firm. International assistance to Kazakhstan in the search for solutions to cyber security risks and challenges could help the country to create an effective system for protecting sensitive information and technologies and ensuring the reliability and resilience of its nuclear industry's IT systems in the face of cyber threats.

Reducing the vulnerability of nuclear-industry facilities requires, first and foremost, an in-depth analysis of Kazakhstan's existing body of laws and regulations related to cyber security and of the relevant procedures pertaining to the protection of nuclear facilities. Involving reputable international specialists and scientists in this process would help develop proposals for improving the country's legislation and procedures, identify existing and potential cyber security threats, and develop effective countermeasures, with an emphasis on proper information protection.

The next step would be to hold comprehensive inspections at nuclear infrastructure facilities to identify vulnerabilities to unauthorized access or acts of IT sabotage. One of the critically important issues that requires close attention is the choice of IT equipment and software for nuclear infrastructure facilities. Cooperation with international partners

would help Kazakhstan introduce required certification and testing procedures for IT equipment and software, and to introduce a set of organizational, legal, technical, and technological measures to make sure that computer networks are properly protected.

The international community could also help Kazakhstan and other Central Asian states set up special cyber units within the national-security agencies, tasked with countering attacks in cyberspace. In addition, individual donor countries could look into the possibility of offering training courses at their universities and colleges to address the shortage of cyber security specialists that currently besets the Central Asian states in various industries, including the nuclear sector.

CONCLUSIONS

Kazakhstan, in cooperation with Russia, the United States, and other interested parties, has made significant progress in reducing nuclear-security-related threats, but more work remains to be done. The end of Russian-U.S. cooperation in the framework of the Nunn-Lugar Program must not put an end to international cooperation in the area of nuclear security, including in Kazakhstan, which has a clear interest in continued collaboration with international partners on the entire range of nonproliferation and nuclear-security issues.

Such cooperation would help the country resolve the problems it inherited from the Soviet Union and develop adequate responses to present-day challenges and threats. Such cooperation also benefits outside powers, as it contributes to the reduction of risks related to nuclear terrorism and illicit trafficking in sensitive materials, technologies, and equipment. These are dangers that obey no borders.



Practical Approaches to Nuclear Security Culture Assessment

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An integral part of assuring the safety of nuclear sites and nuclear materials is work aimed at enhancing nuclear security culture. Such work contributes to the reduction of the human factor negative influence on security. Efforts to bolster nuclear security culture unfold in different directions. It's quite difficult to measure directly such nuclear security culture elements as attitudes, beliefs, values, and dedication to security—all of which belong within the notion of “culture.” A relative evaluation of the level of nuclear security culture may be obtained from analysis of personnel's qualification levels, their physiological and psychological readiness to follow rules and procedures, their values, their commitment to stand against dangers to their organization, and so forth.

CREATION OF REGULATIONS IS THE BASIS FOR ASSESSING NUCLEAR SECURITY CULTURE

Carrying out measures at nuclear sites cannot be done without governing regulations. In Russia the Interagency Nuclear Security Culture Working Group has been established to develop documents that may be accepted for application at Russian Federation nuclear sites, and may be of use for the international nuclear community as well. These documents outline the tasks, goals, and criteria for nuclear security culture at a site simply and clearly, giving the nuclear site administration, middle management, and every employee a standard to judge their individual work results.

These documents are titled “The Nuclear Security Culture Level Estimating Criteria” and “The Organization Order and Evaluation Methodology of the Nuclear Security Culture Level at Nuclear Sites.” The latter—hereafter referred to as the Methodology—establishes a single procedure and a single method for evaluating nuclear security culture level at a nuclear

site. The documents apply to nuclear sites, helping the authorities organize and carry out compliance evaluation on:

- How well the nuclear site (or other organization) activities in nuclear materials manufacturing, use, storage, and reprocessing conform to nuclear security culture criteria
- How well individual personnel adhere to the nuclear security culture principles

The methodology was developed in accordance with the Russian Federation's regulatory requirements in the area of nuclear materials accountability, control, and physical protection. The methodology uses terms and definitions developed by the Interagency Working Group, such as nuclear security culture, nuclear security culture principles, nuclear security culture level, nuclear security culture criteria, and nuclear security culture supporting activity.

PROCEDURE FOR SELF-EVALUATION OF NUCLEAR SECURITY CULTURE

Evaluation of nuclear security culture is conducted for two reasons. First, they estimate the assembly of qualities, principles, attitudes, and behaviors of individuals in an organization directed at sustaining and improving nuclear security by focusing on compliance with the nuclear security culture requirements. Second, they review whether actual material protection, control, and accounting (MPC&A) activity meet the nuclear security culture criteria. Accordingly, the evaluation process includes MPC&A system documents, system operations and work organization as they pertain to security culture, and measures directed at enhancing security culture.

The evaluation takes place in two phases: a self-evaluation by experts from the site, and an evaluation by external experts. The self-evaluation by employees of the enterprise is conducted in accordance with a Director's Order which determines the commission composition and designates its leader or commission chairman. The same order delineates the commission



tasks, sets the standards for evaluating work performance, establishes a schedule for evaluation phases, and explains how the results of the evaluation will be documented.

A commission composition includes a security department representative, a material control and accounting department representative, an administration representative, the nuclear security culture coordinator, technical and MPC&A experts in relevant areas, and representatives from the department subject to evaluation. The commission chairman and members must have the appropriate level of knowledge about security culture, material control, or physical protection. At least five years of practical work in MPC&A and relevant experience, along with the appropriate level of MPC&A area knowledge are required.

The commission chairman guides the commission work, oversees the preparation of necessary documents, informs the head of the department undergoing the evaluation about any serious deficiencies the commission identified, supervises commission members' execution of security measures applicable to the department undergoing the evaluation, and informs personnel responsible for security about the problems and remedial measures. In the process, the commission members gather and analyze facts that are directly related to the evaluation and stay sufficiently informed to draw conclusions about the state of security culture.

The commission conducts its work in accordance with the schedule to present its data and results as set forth in the Director's Order. The schedule contains the departments or services falling under the evaluation scheme, lists the participants, and sets forth the terms and conditions under which the work will proceed. The schedule is negotiated and approved by the head of the organization.



There are several dimensions to the self-evaluation. Commission members review the department documentation to check its availability and completeness, verify the accuracy and precision of the procedures used for the department MPC&A work, and poll departmental personnel through questionnaires and interviews. Commission representatives may observe how staff members actually execute procedures. Interviews reveal how aware personnel are of their duties in regular situations, what actions they should take in case of emergency, and how security culture is fostered at the site.

Accordingly, it is necessary to find a balance between technical specialists and specialists in social sciences and psychology when determining the composition of a commission. The evaluation team finishes the self-evaluation by drawing up a summary report reflecting their findings. Signed by the chairman and commission members, the report is approved by the head of the organization. The heads of the departments that underwent the evaluation sign the report to affirm that they are familiar with its contents.

APPLYING THE SELF-EVALUATION CRITERIA

As noted before, the evaluation is conducted in order to review the performance of an organization or a separate department their compliance with the security culture criteria.

How does an evaluation process actually proceed? It begins with a meeting to present the evaluation goals and tasks, its schedule, the methods and procedures used to conduct it, as well as to explain how commission members will interact with employees from the department undergoing the evaluation, and provide the dates when the commission will hold meetings, issue its interim findings, and convene

Fig 1. An Example of the NSC Assessment Criteria

Nuclear Security Culture Evaluation Criteria		
Criterion	Evaluation	Notes
1. The enterprise order or special statement from the administration which points out that MPC&A is a major component of the enterprise's major activity.	<p>In order to evaluate the compliance with this criterion one must make sure that it is referred to in the enterprise's charter or in a special document that declares MPC&A the main type of activity.</p> <p>The criterion is considered accomplished if such a statement is in the enterprise charter or other special document.</p>	
2. Documents that determine the MPC&A functions for all enterprise divisions involved in solving MPC&A problems, including their actions under emergency situations.	<p>In order to evaluate this criterion it is necessary to make sure that the documents determining MPC&A functions, including those containing the requirements for emergency actions, are available.</p> <p>The criterion is considered accomplished if there are regulatory documents with such requirements.</p>	When evaluating, one can use the regulations, instructions, or guidelines under emergency situations.
3. MPC&A personnel have duty regulations that are revised on a regular basis.	<p>In order to evaluate this criterion it is necessary to make sure that the duty regulations are available and ask the head of the division to present the procedures along with the dates when they were revised or updated.</p> <p>The criterion is considered accomplished when the staff produces such duty regulations along with documentation indicating the dates when they were revised or updated.</p>	



the final meeting for everyone involved in the entire process.

Work assignments among the experts are determined by the commission chairman. During the evaluation the experts use the security culture criteria to judge how well the department is performing. When members of the commission detect an irregularity, they evaluate its possible consequences and provide expert commentary on the problem. An authorized representative from the department can either confirm that the irregularity exists or supply evidence to rebut the commission conclusion.

Upon completion, the commission chairman reports the results at the final meeting. The main goal of the meeting is to present the results to the heads of the departments undergoing evaluation so they understand the results—especially problem areas—clearly. The chairman delivers an overall conclusion of the state of nuclear security culture within the departments. Based on these results a document is drawn up, specifying any deficiencies detected. The chairman is responsible for the report accuracy, completeness, and authenticity.

The final report contains the goals and areas subject to evaluation, the basis for the inspection, the time it was carried out, the roster for the commission, the subjects investigated, the conclusions based on the commissioners' findings and recommendations. The schedule for the evaluation, protocols for handling irregularities and evaluation criteria constitute an attachment to this document. It is signed by the commission chairman and members, the heads of the departments inspected, and the head of the organization.

If any remedial actions are warranted, the department head develops an action plan for approval by the head of the organization. The original copy of the plan is kept with the evaluation report. The site's security culture coordinator monitors corrective efforts, ensuring the staff implements the recommendations and proposals elaborated by the evaluation commission.

The security culture evaluation criteria and the Methodology have been tested at two Russian and two U.S. sites: "LUCH" and MATI "Atomenergo" (Rosatom) in Russia, and the Oak Ridge National Laboratory and Y-12 (U.S. Department of Energy) in the United States. Reviewers from both countries concluded that the criteria and review procedures were generally applicable to any nuclear site—not just Russian facilities. Accordingly, the methodology is being implemented at Russian sites as described.

CONCLUSION

The overarching reason for investigating security culture is the fact that MPC&A ultimately depends on individuals, and on how they interact with technical systems. A systematic evaluation, analysis of problems, and corrective action improves nuclear site operations helping to prevent security breaches or to respond swiftly and effectively should they occur.



Measuring the Impact of Nuclear Security Training: The Case of the World Institute for Nuclear Security Academy and Its Professional Society

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The terrorist attacks that took place on September 11, 2001 dramatically changed nuclear organizations' perception of threats. In the last fourteen years, accordingly, governments have instituted much more stringent regulatory requirements, while nuclear operators have spent considerable time and money to upgrade their physical-protection arrangements to meet them. It is now widely understood that managing a complex nuclear-security program requires both competent management and ongoing training.



WORLD INSTITUTE FOR
NUCLEAR SECURITY

Indeed, training is one of the most effective leading indicators for security. Nuclear-security training should start upon hiring and continue regularly as employees' job titles change and their responsibilities grow. Due to evolving threats, emerging technologies, and increasing security standards, we expect that the demand for ongoing professional training in the nuclear security workforce will continue to expand for the foreseeable future.

MEASURING THE IMPACT OF NUCLEAR SECURITY TRAINING

Thanks to the recognition that training is required for long-term capacity-building, funding for nuclear-security training programs has increased substantially

in the last decade, leading to a rapid rise in programs. In 2012, representatives from 30 IAEA member states gathered in Vienna to establish the International Network for Nuclear Security Training and Support Centers (NSSC Network), which now includes 58 institutions from 49 countries.

Nuclear-security training programs are meant to support organizations' goals and strategic objectives. They also represent a significant investment from organizations. For all of these reasons, it is important to validate their quality and impact in order to guide future development.

Unfortunately, reliable, effective measures for evaluating the impact that nuclear-security training has on organizational behavior have lagged behind the growth in training.

This is why it has become critical to find effective, repeatable ways for funders to measure the return on investment (ROI) in such programs. Two models have been found to be especially effective in this regard: the Kirkpatrick Model and the Philips Return on Investment Model.

THE KIRKPATRICK AND PHILIPS RETURN ON INVESTMENT MODELS

The Kirkpatrick Model is one of the most widely used approaches to evaluating training results. Its objective is to help organizations determine the extent to which participants can apply their training to their work in a way that demonstrably increases organizational performance. The model consists of four levels of evaluation:



Level 1: Reaction: The degree to which participants react favorably to training.

Level 2: Learning: The degree to which participants acquire the intended knowledge, skills, attitudes, confidence, and commitment based on their participation in a training event.

Level 3: Behavior: The degree to which participants apply what they learned during training when they are back on the job.

Level 4: Results: The degree to which targeted outcomes occur as a result of the training event and subsequent reinforcement. Unless the development and design of the security training program take these performance objectives into account and turn them into specific learning objectives, a high likelihood exists that the training will be mismatched to the needs and priorities of the organization.

Another comprehensive evaluation methodology commonly used to assess the business impact of training programs is the Philips Return on Investment Model. This methodology, which evolved from the Kirkpatrick Model, adopts the concept of ROI to yield additional, critical insight. To do so, it uses isolation techniques to separate training's impact from other potential factors in business improvement. One major difference from the Kirkpatrick Model is that because ROI compares benefits to cost (usually expressed as a percentage of the original investment), it requires that all data be converted into monetary values, including program fees, travel costs, employee salaries, and employee time. However, the methodology also recognizes that many benefits gained through training programs are intangible and do not translate easily into a dollar value. Examples include increased job satisfaction, increased confidence in one's ability to fulfill job expectations, increased compliance with procedures, increased capacity to coach other employees, and decreased learning time for new managerial responsibilities.

INTERNATIONAL STANDARDS ORGANIZATION (ISO)

Another important piece in the effort to measure training-program quality and effectiveness is the ISO 29990:2010 standard, "learning services for non-

formal education and training." According to ISO, this standard "aims to improve the quality of offerings on the global market that has grown up around non-formal education and training, such as vocational training, life-long learning and in-company training." ISO expects this standard, which encourages a focus on the learner, to enhance transparency and make it possible to compare training programs on a worldwide basis.

PROFESSIONAL SOCIETIES

Because the training offered by Centers of Excellence is typically designed to evaluate only participants' reactions to the training program (Level 1 of the Kirkpatrick Model) and does not generally involve structured evaluation and certification, it largely fails to build sustainable professional capacity within the nuclear community. We believe that one solution for this challenge is to use professional societies as a forum in which to better assess the impact of training, support ongoing professional development, and build capacity for security managers.

An excellent example of this approach comes from the aviation sector. In 2004, the International Civil Aviation Organization (ICAO), headquartered in Montreal, Canada, and its academic partner, the John Molson School of Business of Concordia University in Montreal, teamed together to establish and accredit the Aviation Security Professional Management Course, which leads to the professional designation AVSEC PM as set forth in ICAO's security standards. In 2007, furthermore, ICAO partnered with the Airports Council International (ACI) to launch the ACI-ICAO Partnership.

The partnership's goal is to establish a global standard of excellence in the field of airport management and to train the next generation of airport leaders. The partners' Global Airport Management Professional Accreditation Program gives airport executives worldwide the opportunity to earn the International Airport Professional designation. Graduates from these programs are invited to an online community of aviation-security experts, where they can engage in "interdisciplinary networking and developing best practices of airport business for the benefit of the aviation industry" share "best practices and training strategies," and promote "intra-regional and international cooperation" with fellow members.



Key success indicators are gathered through these platforms to measure the enduring and long-term impact of the training provided.

THE WORLD INSTITUTE FOR NUCLEAR SECURITY ACADEMY

Since 2012, the World Institute for Nuclear Security (WINS) has spent considerable time and effort developing a model nuclear-security training and certification program called the WINS Academy. Its target audience is a multi-disciplinary group of professionals with management responsibilities for nuclear security, including board members, executive managers, security directors, scientists, technicians, and engineers, offsite incident responders, and regulators. As an overall framework, the program uses ISO standard 29990:2010, through which WINS received certification in 2014.

One of the major premises underlying the WINS Academy is the necessity to demonstrate individual competence through professional certification sanctioned by a proctored exam. This corresponds to Level 2 of the Kirkpatrick Model. Leaders of the nuclear industry who participated in the 2014 Nuclear Industry Summit in the Netherlands supported this approach when they committed to ensure that “all personnel with accountabilities for security are demonstrably competent by establishing appropriate standards for the selection, training, and certification of staff.”

SURVEY PROGRAM

To better understand what our certified graduates value most in their ongoing professional development, we have established a comprehensive survey program.

This includes a survey that learners complete as soon as they finish a course and a survey they complete after they have finished their exam. We also solicit our participants’ feedback on a regular basis, in keeping with Level 1 of the Kirkpatrick Model.

RECERTIFICATION

Because the issues surrounding nuclear security continue to change rapidly, it is important for professionals to continue learning and updating their skills throughout their careers. Consequently, we have made recertification mandatory every three years. This can be achieved by earning credits through documented continuous professional development or by passing an exam.

SELF- ASSESSMENTS

To enable us to better evaluate changes in our participants’ beliefs and attitudes (i.e., the intangible benefits identified in Philips’ ROI Model), every course module begins and ends with self-assessments. The pre-assessment helps

participants begin to focus on the major topics covered in that module and to reflect on what their attitudes and beliefs are about these topics. The post-assessment helps participants understand how their knowledge and attitudes have changed as a result of taking the course.

WINS ACADEMY ALUMNI NETWORK

A critical aspect of the WINS Academy is the new WINS Alumni Network, which is open to all WINS Academy graduates with valid certifications. To create this program, we drew on models from aviation and other sectors.



We believe that this platform represents an ideal forum in which to engage with our graduates and evaluate the impact of the WINS Academy training. It also enables us to provide graduates with additional networking and training opportunities, such as webinars, discussion forums, and workshops, and enhances our ability to measure their performance improvement. One of the most important benefits is that the network is creating a cohort of experts with certified nuclear-security competence who are willing to advocate for professional development among their peers.

MEASURING THE LONG-TERM IMPACT OF WINS ACADEMY TRAINING

We launched our certification program in 2014, so data about the program's efficacy are still in the early stages. However, we have already enrolled over 470 participants from more than 65 countries and established key performance indicators (KPIs) that are instrumental to WINS' ISO 9001-certified quality-management system, as well as to measuring the impact our training is having on participants. Examples of these KPIs include total enrollment, number of certifications delivered, pass/fail rates, exam scores, participant feedback, and financial targets. In addition, we continuously survey participants and graduates of the program to establish new metrics and measure the transfer that occurs in their behavior as a result of the training. This corresponds to Level 3 in the Kirkpatrick Model.

One of our next steps is to find out how training and certification are affecting our participants' career and advancement opportunities. We plan to analyze the data (especially relating to salary, work hours, job satisfaction, and knowledge transfer) to identify trends in behaviors and results. In addition, we plan to create a career report that can be used by individuals

and organizations to evaluate the results of training. This corresponds to Level 4 of the Kirkpatrick Model.

CONCLUSION

To justify the time and expenditures made on nuclear-security training, WINS believes that all international nuclear-security training efforts must lead to sustainable and measurable improvements in security. We recognize that building learning frameworks, developing quality materials, and creating an effective certification program are much more complicated and time-consuming than simply running awareness courses, but such an approach is also much more likely to lead to sustainable and strategic improvements internationally. The key to verifying such assumptions is to collect and analyze data that accurately measures impact.

Since 2012, the World Institute
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Academy.

We envision that WINS Academy-certified practitioners will play an instrumental role in promoting nuclear-security certification and continual professional development among their peers. Over time, this will help to build a network of security-trained professionals who lead the effort to create meaningful and sustainable changes to security culture worldwide. In the long

run (within five to ten years), we envision that this group will be at the forefront of new professional requirements for nuclear-security competence, with certification becoming the norm. We also believe that certification will lead to employment benefits that include increased salaries and managerial responsibilities. If so, nuclear security will become self-sustaining as our graduates reap the benefits of their expertise.

International Nuclear Security Education Network at Five Years

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NETWORK

With the International Nuclear Security Education Network (INSEN) having celebrated its fifth birthday in April 2015, this short article summarizes its achievements to date and its plans for the future. The network formed in 2010 is a membership organization that brings together educational and research institutes and competent authorities that are currently involved in or plan to deliver educational courses in nuclear security. Relevant international or nongovernmental organizations may also request to participate or support INSEN's activities and attend its annual and working-group meetings. By bringing these relevant stakeholders together the network provides a forum for the collaborative creation of new educational materials and professional-development opportunities in this area.

INSEN is supported by the International Atomic Energy Agency (IAEA), which coordinates its biannual meetings, provides a platform for materials-sharing and communication, and funds various network activities. Through supporting the growth of new educational courses, the network aspires to fill an important global educational and training gap in this area, and in doing so embed a culture of security from the early stages of a future nuclear professional's career. At the network's inception in 2010, there were just a handful of academic nuclear-security programs worldwide. None were comprehensive in scope or capable of educating the large numbers of graduates who go on to work with nuclear and radiological materials and technologies.

Course development in the area of nuclear security is a challenging task, due in large part to its broad and intrinsically multidisciplinary nature. This requires academics to reach beyond the confines of their own disciplines, cover unfamiliar topics, and employ a wide range of teaching and assessment methods. A comprehensive course in nuclear

security would cover diverse areas such as radiation protection, counterterrorism, physical protection, threat assessment, crime scene investigation, and the detection of nuclear and radiological materials outside of regulatory control.

In order to explore these complex topics, frameworks and concepts must be drawn from both the hard and soft sciences, with relevant fields including physics, engineering, information technology, applied security studies, management and behavioral studies, and psychology. In considering what courses could make up such a program, the IAEA's Nuclear Security Series no. 12 (NSS 12), Educational Program in Nuclear Security, provides a useful guide, outlining the bare-bones structure of both master's and certificate programs in nuclear security.

In its production of teaching materials and launch of professional-development opportunities, INSEN has sought to flesh out this framework, focusing its activities around the twelve required and ten elective modules of NSS 12. This is particularly true when it comes to the collaborative development of teaching materials. Over the past five years, INSEN members have produced detailed lecture slides, tabletop exercises, assessment questions, and session plans for eleven of the aforementioned required courses and three of the elective courses.

These materials are freely available for INSEN members to use and adapt for their own internal courses, and to serve as a means for reducing the development time necessary to set up new courses from scratch. INSEN members have also authored a number of nuclear-security textbooks for use across nuclear security programs. As part of the development process, materials are internally reviewed in order to regularize formatting, improve quality, and ensure consistency with IAEA terminology.

As well as developing educational materials for use in academic programs, the network has sought to provide professional-development opportunities for faculty members, with a focus on supporting curriculum-





International Nuclear Security Education Network

design efforts. These professional-development courses (PDCs), largely implemented as two-one week programs, explore different approaches to teaching nuclear security, applying current pedagogical thinking to key topics. Over the past five years, PDCs have been run by network members in Europe, sub-Saharan Africa, South Asia, and Southeast Asia, on subject areas that include: “Introduction to Nuclear Security”; “Insider Threats to Nuclear Facilities”; “Information Security and Security Culture”; “Nuclear Regulation”; and “Information Technology and Cyber Security.”

By adopting a “train-the-educator” approach to professional development, the PDCs have sought to introduce academics to new types of teaching and assessment methods from outside their disciplines, and to demonstrate how they might be applied within the nuclear-security domain. They have also provided an opportunity for detailed critiques of individual nuclear-security curricula under development. Over the past five years, more than one hundred academics from more than forty institutes have attended one or more PDCs, taking the new educational approaches introduced back to their colleagues.

INSEN has also been active in promoting the importance of nuclear-security education at relevant international forums and within individual organizations and, by doing so, serving to grow the network. Over the past five years, presentations on INSEN activities have been delivered at major nuclear conferences and workshops on the international, regional, and national levels, including the International Nuclear Material Management Annual Meeting and meetings of the American Nuclear Society and the United Nations' 1540 Committee. The network has also seen significant growth during this time, from just 20 members at its inception to 251 members from 133 institutions in over 49 states as

of June 2015. Although some regions are still somewhat underrepresented, it is fair to say that INSEN has matured into a true global network.

While the above activities may be considered impressive, judging the true value of INSEN must be related back to its ultimate objective of supporting the establishment

of new educational programs in the area of nuclear security. With new university programs typically taking several years to pass through internal review processes and the network only five years old, it is difficult to accurately gauge the impact of the aforementioned activities at this stage. However, initial signs have been promising. In the last couple of years, tens of INSEN members have launched new nuclear-security courses at their institutes. These range from short elective courses to comprehensive master's-level programs.

Some of the most ambitious initiatives to date include two master's programs on nuclear safety, security and safeguards, launched by the University of Central Lancashire in the United Kingdom and Chulalongkorn University in Thailand. In 2013, six INSEN members, led by Delft University of Technology with the support of the European Union, launched a master's program in nuclear security, drawing heavily on INSEN-developed materials and faculty who had undertaken the aforementioned professional-development opportunities. Although ultimately this program proved impractical to run in its current arrangement, the universities involved are looking to build on this experience by working together to launch both short nuclear-security courses and an online master's program.

While there have been significant achievements over the past five years, INSEN's growth into a global organization of significant size present an opportunity for future network activities to expand in terms of scale and scope. The completion of teaching materials within the framework of NSS 12 should remain a priority. And with a number of new textbooks due to be finalized and made available shortly, and additional INSEN members contributing to this process, the bulk of this work should be completed within the

next twelve months. At that stage, attention will turn to regular updating of these materials based on user feedback, as greater numbers of INSEN members start teaching the materials at their home institutions. In order to facilitate this process greater emphasis should be placed on translating INSEN materials into non-English languages. Given the growing technical competency of the INSEN membership and the number of languages spoken within the network, this is something that should be readily achievable.

As is the case with all Nuclear Security Series guidance documents, NSS 12 is due to be revised by the IAEA in the next couple of years. It is important that INSEN feed into this process, drawing on members' experiences in designing and implementing courses in this area. More specifically, the update will provide an opportunity to place greater emphasis on "softer" approaches to nuclear security, including topics such as knowledge management and security culture. The importance of the human factor within nuclear-security systems has been clearly demonstrated through incidents such as the 2012 break-in at the U.S. Y-12 nuclear facility. It plays a critical role in security outcomes, and this should be reflected by greater emphasis within educational courses in this area.

This will not be a trivial undertaking, however, as nuclear security culture in particular a relatively new and "intangible" concept, with IAEA technical guidance documents in this area due to be released in 2015 and 2016. Consequently, INSEN should explore the launching of new professional-development opportunities in this area. These should examine both the concept of security culture, how it can be assessed and enhanced within different organizations and crucially different approaches to teaching and assessing a course on this topic.

Another area for INSEN to explore is greater collaboration with INSEN's sister network of Nuclear Security Support Centers (NSSC), established in 2012. The NSSC Network, which is largely composed of nuclear and radiological regulatory bodies and operators, shares many parallels with INSEN, albeit with a greater focus on training as opposed to academic education. Here there are multiple areas of mutual interest, including the development and review of practically focused teaching tools, the joint or supported offering of nuclear security courses, and

the mutual exploration of emerging topics such as security culture.

NSSC members could critique INSEN-developed teaching materials from a practitioner's perspective. For example, they could help enhance the realism of hypothetical facilities used in tabletop exercises. NSSC members could also play a valuable role in providing real or realistic data on nuclear-security-related incidents that could then be developed by INSEN members into case studies.

Given the different but complementary backgrounds of INSEN and NSSC members, there is also a strong argument to be made for direct collaboration when it comes to offering either education or training programs. This type of joint activity is already happening to an extent. In Pakistan, for instance, the Pakistan Institute of Engineering and Applied Sciences now collaborates with the Pakistan Nuclear Regulatory Authority. Finally, there is an opportunity for NSSC and INSEN members to work together in exploring emergent areas. One candidate would be the joint development and application of methodologies for assessing security culture at different types of nuclear and radiological facilities, building on IAEA guidance in this area.

Finally, given the experiences and successes of INSEN over the past five years, it is perhaps worth considering what lessons could be transferred to related areas, in particular the chemical and biosecurity domains. Here INSEN could provide a useful model for the organic growth of new educational programs in this area, which might be taken up by bodies such as the Organization for the Prohibition of Chemical Weapons. It would be beneficial to bring together institutes already teaching chemical and biosecurity courses with INSEN members in order to share experiences and discuss different approaches to the design of security courses for technical and non-technical specialists. Although these are distinct subjects in their own right, there are likely to be considerable commonalities when it comes to curriculum design, teaching and assessment, and approaches to key topics such as insider threats and security culture. These are eminently worth exploring.



Removing Risk: Replacing High-Risk Radiological Sources with Alternatives

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THE PREVALENT RISK TO REDUCE

On April 13, 2015, several truck drivers parked at a grocery store in Tabasco, Mexico, and decided to leave their truck unattended. Upon their return, they realized their cargo—a container carrying iridium-192 (Ir-192) that was used for industrial radiography—was missing. Fortunately, the thieves appear not to have realized what they had stolen and left the container carrying iridium-192 on the side of the road, where the Mexican authorities recovered it. Although this incident and several other similar thefts that occurred in Mexico in the past several years have not led to a catastrophic event, they have reinforced concerns regarding the security of high-risk radiological sources used in civilian applications. These thefts, when combined with the financial and sociological costs associated with the notorious 1987 accident in Goiânia, Brazil, illustrate how an individual or group with malicious intent could cause significant harm.

A meaningful way to reduce the risk of radiological terrorism would be to remove the main ingredient for such an attack by replacing high-risk radiological materials with appropriate alternatives that use less dangerous or non-radionuclide materials or mechanisms. Ideally, adequate security measures for high-risk radiological materials would effectively counter risk. However, the ideal security environment that properly protects all high-risk radiological sources in civilian applications may not be achievable due to the sheer number of sources, facilities lacking resources (e.g., financing, technical background, and training), and individual levels of appreciation for security culture. The U.S. Government Accountability Office (GAO) highlighted these issues in a 2014 report on radiological security, noting that there are 1,400 U.S. facilities with high-risk radiological materials. GAO site inspections revealed that security measures varied from facility to facility, and some facilities

with security systems failed to properly employ the measures that were installed. For example, enclosed areas with high-risk radiological sources were sometimes left unlocked.

Thus, it is important to consider eliminating the use of high-risk radiological sources altogether when feasible. By replacing such materials, the threat is permanently eliminated, as the material no longer remains present and neither industry nor the government needs to maintain costly security measures. By examining the potential for replacing high-risk radiological material, specifically with cesium chloride (CsCl or Cs-137) in blood irradiators, a road map can be drawn and used for other high-risk radiological materials.

REPLACING CS-137 FOR BLOOD IRRADIATION

Cs-137 in blood irradiators is a prime candidate for replacement, considering it is considered one of the most likely high-risk radiological materials to be used for a dirty bomb. This belief is due to the prevalence of blood irradiators in publicly accessible facilities (e.g., hospitals and blood banks) and the physical characteristics of Cs-137 in blood irradiators (a small metal container containing powdered Cs-137 that is easily dispersed and water-soluble). In 2008, the National Academy of Sciences (NAS) published a report titled Radiation Source Use and Replacement that found that non-radionuclide alternatives either reproduced or exceeded the capabilities of Cs-137 blood irradiators, albeit at greater cost. Such replacements would require government action to be widely adopted.

As a result of the Energy Policy Act of 2005, an inter-agency Task Force on Radiation Protection and Security was formed to provide security recommendations pertaining to radioactive materials. In their 2010 report, task-force members concurred with the NAS study's findings and said Cs-137 blood irradiators should be phased out of use gradually. In the meantime, various agencies would work with operators to voluntarily





Pomper & Gluck: An Indian emergency response team identifies and removes contaminated objects after losing control of an irradiator with a sealed source.

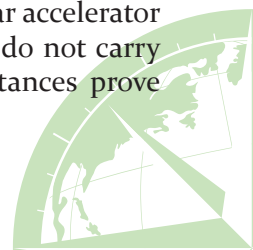
replace Cs-137 blood irradiators with more secure alternatives. The 2014 report went a step further and recommended further encouragement by industry through incentives. Additionally, the report noted that the federal government should lead by example, following in the footsteps of the U.S. Department of Defense, which is replacing its Cs-137 blood irradiators with alternatives. Since the 2014 report, the task force has created a working group with various stakeholders to further explore replacement technologies, but has taken little concrete action to push for conversion.

As aforementioned, one of the main hindrances with adopting alternatives is the cost. Replacing a Cs-137 blood irradiator occurs approximately every thirty years due to the half-life of the radioactive material and requires little electricity to operate, since the Cs-137 is always emitting gamma radiation. Regarding operability, an AABB survey indicated that Cs-137 blood irradiators are more reliable, less likely to break down over long periods of time, and require little

training to operate

Despite the apparent cost advantages, maintenance and upkeep figures do not take into account the costs associated with security measures, liability, and decommissioning. Security measures can cost up to \$25,000 to install, which does not include the yearly upkeep costs for physical or operational security measures. Even if a facility creates a security apparatus, in the event that Cs-137 from a blood irradiator is used in a terrorist attack, there is no insurance policy covering such an incident. The facility would be required to pay all damages out of pocket. Additionally, every time a Cs-137 blood irradiator gets replaced, the government foots a bill upwards of \$100,000 to ship the material because facilities would be unable to pay the expense.

Alternatives to Cs-137 such as x-ray, linear accelerator (LINAC), and ultraviolet A (UVA) light do not carry those hidden costs, and in certain instances prove



more useful. X-ray blood irradiators are the main alternative for dedicated blood irradiation machines and, when comparing a Cs-137 with an x-ray blood irradiator made by Best Theratronics, are able to irradiate more blood bags per minute than Cs-137 machines. LINACs serve a double purpose for facilities that cannot afford multiple instruments. Originally used for cancer treatment, LINACs can be configured to irradiate blood as well, and thus allow smaller facilities to meet multiple necessities.

The last main alternative is using UVA to activate Amotosalen injected into blood bags, called the INTERCEPT system by Cerus. UVA-based irradiation provides multiple benefits, such as preventing transfusion-associated graft versus host disease better than Cs-137, being a small system that can fit on top of a table, costing less for each unit, and causing pathogen inactivation in blood components (e.g., viruses, bacteria, and protozoan) where x-ray and Cs-137 blood irradiators cannot. Due to security concerns over Cs-137 blood irradiators and the other public-health benefits of alternative non-radionuclide blood irradiators, certain countries in Europe are taking a harder stance to push for their blood irradiator operators to make the conversion.

ROAD MAP TO CONVERSION

Considering that replacement options would require government action, it remains appears a top-down approach is necessary for replacing high-risk radiological materials. In the case of Cs-137 blood irradiators, alternatives do exist but have not been widely adopted voluntarily. Based on what has occurred with current efforts to replace high-risk radiological materials, a national road map would illustrate how to determine which high-risk radiological materials are appropriate to replace and sets a timeline for completion.

A meaningful way to reduce the risk of radiological terrorism would be to remove the main ingredient for such an attack by replacing high-risk radiological materials with appropriate alternatives that use less dangerous or non-radionuclide materials or mechanisms.

- Years 1–2: create three databases/studies to determine priorities for replacement: (1) a subnational (state/province) database of planned or currently used high-risk radiological sources, including the materials' physical properties, devices and uses for the high-risk radiological material, and manufacturer of the devices; (2) a national and global listing of high-risk radiological-material providers and manufacturers of sources; and (3) national-security requirements and international best practices for sources and materials to determine the perceived hazard posed by the source or

material. These three studies would provide a baseline for setting priorities.

- Years 1–2: obtain funding for research and development (R&D) programs for alternatives, including a budget for the purchase of replacement technologies.

- Continuous: after priorities are determined: begin replacing the highest-risk sources. Continue to reevaluate the

priority listing to take into account R&D advances and risks. This includes funding R&D for highest-priority replacement devices.

- Continuous: conduct outreach to professional societies and manufacturing groups.
- Years 1–5: work with legislature on legislative actions and offering incentives (e.g., tax credits, compensation, cost-sharing) for adopting replacements.
- Years 1–10: continuous-replacement-program monitoring and evaluation, including reviewing criteria and collecting information for updating at years 3, 5, 7, and 9.

In addition to such a road map being applicable to Cs-137 in blood irradiators, there are other high-risk

radiological materials that should be the focus of any replacement attempts. Sixteen radiological materials are identified as high-risk, five of which, including Cs-137, are widely used commercially: cobalt-60 (Co-60) in food and blood irradiators, teletherapy, and brachytherapy; Ir-192 in industrial radiography; americium-241 for calibration and gauges; and americium-241/beryllium (Am-241/Be) for well logging and moisture detection. In some instances the sources do not carry enough of the radiological material for a high-impact dirty bomb, but their widespread application makes them easily attainable. These particular materials and sources thus should be placed high on the priorities list.

However, replacement may not be feasible because a viable alternative does not readily exist, which is where R&D programs could have a significant impact. For food sterilization, there are x-ray alternatives, but their size, cost, and output are major disadvantages that would require multiple x-ray machines and complete facility redesigning to match the output of Co-60 and Cs-137 food irradiators. For the oil and gas industry, replacing gauges that use Am-241/Be would result in losing historical data for gas and oil fields, because current alternatives represent the measurements differently. Firms would be unable to calculate the remaining quantities of oil and gas at a site and locate the best places to drill. In certain cases, alternative technologies are infeasible and would cause detrimental effects to industry.

Thus, it is important to make replacement priorities on a case-by-case basis as opposed to starting with certain high-risk radiological sources just because they are considered the most lethal. To properly identify what to replace, a significant amount of information would be necessary that would be derived from existing sources and newly created datasets.

Particular information may be difficult to come by, as it may not exist because there is no current mechanism for information-gathering. For example, certain countries may have high-risk radiological sources but have no regulatory body to oversee their use, and thus no official accounting system. Additionally, certain regulatory bodies may be unaccustomed to radioactive-materials controls, as the emphasis for decades was on nuclear-materials management only. For those reasons, certain national governments may face particular problems in making replacement a

priority because they do not know what is being used domestically or have appropriate security controls and regimes for high-risk radiological materials. In such instances, international outreach and assistance to national governments and operators (i.e., companies, universities, and professional societies) would need to happen simultaneously to promote radiological security measures and culture to the point where replacement can occur.

CONCLUSION

Although many consider the threat posed by high-risk radiological materials to be more of a weapon of mass disruption rather than mass destruction, the risk is still great enough to warrant action. Government, working with industry, can make great strides toward replacement. Given the road map above, national governments can see their way through the replacement process. The timeline is primarily focused for a national replacement strategy, but international cooperation on such matters would need to occur simultaneously and should be flexible enough to account for any changes or national characteristics. As with high-risk radiological sources that have viable replacement options that diminish or reduce the risk of radiological terrorism, as with Cs-137 in blood irradiators, the cost of inaction is greater than the cost of conversion.



Global Summit on Chemical Safety and Security

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More than 85 percent of all declared chemical weapons globally have now been destroyed under international verification, and most of the remaining stockpiles are fated to disappear in the next few years. But this historic achievement—unprecedented in the annals of arms control—has contradictory implications for the Organization for the Prohibition of Chemical Weapons (OPCW), the implementing body for the Chemical Weapons Convention.

Since its establishment in 1997, the bulk of the OPCW's budget and human resources has been devoted to verifying chemical-weapons destruction operations through continuous on-site inspections. With this prime element of its mission nearing completion, the question that looms over the OPCW today is: will it radically downsize as the need for those verification activities disappears, or will it shift those resources into other areas of its mandate? This existential issue has vexed the OPCW for several years now, yet the agency appears no closer to resolving it.

Meanwhile, the dramatic growth and dissemination of the global chemical industry in recent decades has made chemical accidents a routine occurrence and increased the risk that toxic chemicals could be intentionally misused to harm people and the environment. Both accidents and deliberate acts pose clear challenges to international security. How are these challenges being met? The OPCW should be a central platform for discussions, capacity-building, and exchanging experience and information in this vital sphere, but is hindered by a weak mandate from its membership and by limited resources.

Enter the International Center for Chemical Safety and Security (ICCSS), an independent nongovernmental organization established in October 2012 that is based in Warsaw, Poland.

The ICCSS was created as a bottom-up initiative of people from different backgrounds with a wide array of technical experience and expertise, including industry managers, engineers, academics, and representatives of national and international organizations. It functions as a public-private partnership to promote development of a chemical safety and security culture at the national, regional, and global levels. All ICCSS programs are based on five core principles: sustainability, continuity, public-private partnership, multi-stakeholder participation, and modern management.

The ICCSS seeks to provide continuity to international efforts to promote chemical safety and security and focuses on enhancing capabilities for research, development, storage, production, and safe use of chemicals for peaceful purposes. The Center programmatically links process safety with security, combating the use of chemistry for illegal activities, and devotes special attention to countries that need to establish an environment of chemical safety and security to enable economic and technological development.

Three major ICCSS initiatives are currently underway that showcase this approach. The first of these aims to establish a sustainable system of chemical safety and security in Kenya, with the intention of extending the program to other countries in the East Africa region. The program involves Kenyan and Polish stakeholders from government, industry, academia, and NGOs, and has received active support and participation from the Center for International Trade and Security (USA), Dow Chemicals, AT Kearney, and TNO (the Netherlands). The program will be offered to relevant countries elsewhere in East Africa, with an emphasis on border, customs, and transportation officials, helping enhance chemical safety and security as toxic chemicals transit the region. The program will build networks of contacts and best-practices exchanges to stem proliferation and terrorism threats.

The second ICCSS initiative aims to improve security in Ukraine by enhancing chemical safety and security.





Luhan: The venue of CHEM SS 2016 to be held in Kielce, Poland.

The program is being developed and implemented under the joint leadership of the Organization for Security and Cooperation in Europe's (OSCE) Conflict Prevention Center, ICCSS, and Ukrainian Chemists Union, and will promote implementation of UNSCR 1540 (2004) with support from the UN Office for Disarmament Affairs.

The Ukraine program was born at a national round table in Kiev in December 2014 that produced a set of specific recommendations for action, followed three months later by a meeting at the OSCE in Vienna, where the main Ukrainian and international stakeholders agreed on a road map for overall implementation and initial projects, with the ICCSS assuming the role of international coordinator.

The Ukraine program will begin with a comprehensive review of relevant legislation, regulatory bodies, existing chemical trade regulations, and the national chemical industry to ensure consistency with UNSCR 1540, the Chemical Weapons Convention, and other international instruments. The operational stage will have two initial projects. One will introduce local awareness of and responsibility for safety and security within the chemical sector, focusing on regions where

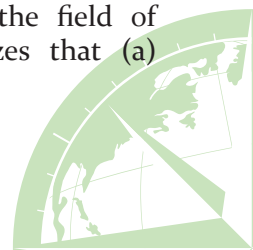
chemical industries have been damaged in war. The other project will provide training to enhance border and customs controls over the transportation of toxic chemicals. The program was presented at the most recent meeting of the G-7 Global Partnership, held in Munich in April 2015.

“CHEM SS 2016” is not a government-led initiative but one that comes from the grassroots level—from those who are directly engaged in enhancing chemical safety and security.

The third ICCSS initiative is a program to promote local actors' awareness of and responsibility for chemical safety and security. This initiative aims to enable local governments and actors to meet the safety and security challenges posed by the increasing use of chemicals, and by access to hazardous substances at the local level. Its main focus is to create sustainable

local development policies that incorporate safety and security into chemical production, especially among small and medium-sized chemical companies (SMEs) and operators. Enhancing security and safety in chemical waste management and the transportation of hazardous materials is a priority as well.

Through these and other activities, the ICCSS is pioneering a shift of perspective in the field of chemical security. This shift recognizes that (a)



chemical security is not just a technical problem for professionals to solve, but rather an enterprise-wide issue; (b) it should not be merely the subject of sporadic attention, but rather integrated into planning and business cycles; and (c) it is not an expense, but rather an important investment.

ICCSS has also shifted attention from weapons-of-mass-destruction disarmament and the prevention of WMD terrorism to enhancing measures to prevent and respond to the misuse of CBRN agents. It has replaced efforts to quell the proliferation of chemical weapons with efforts to prevent their reemergence while protecting human health and the environment.

At the same time, the ICCSS has combined the concepts of chemical safety and security with a bottom-up approach that actively engages local authorities and addresses chemical safety and security in all peaceful uses of chemistry, with an emphasis on SMEs and the transport of hazardous substances.

To promulgate these new concepts and approaches, the ICCSS will stage a global event dubbed “CHEM SS 2016” to be held from 16-18 April 2016 in Kielce, Poland. This will be the first global multi-stakeholder event dedicated to addressing safety and security solutions in the supply chain, from raw materials to infrastructure to production, transportation, and use of chemicals in all areas of chemical activity. “CHEM SS 2016” will bring together leaders and practitioners in all disciplines of chemical safety and security and from all stakeholder communities, including government, industry, academia, and civil society.

The ICCSS aims for this event to be a tipping point in national and international efforts to globalize chemical safety and security with coherent approaches that involve all stakeholder communities, and to enhance safety and security culture to meet

the requirements of the chemical industry. It will not seek to generate new regulations or standards, but rather to internationalize and operationalize the best existing solutions and practices in chemical safety and security through the whole chain of chemical activities. “CHEM SS 2016” will:

- Provide a global forum for the views of all stakeholders on ways and means to enhance chemical safety and security
- Enhance awareness, training, and best practices in all areas of chemical safety and security
- Foster the exchange of experience, ideas, and knowledge among national and international organizations involved in chemical safety and delivering assistance

- Bring together governments and companies that are producing state-of-the-art solutions to improve chemical safety and security, and familiarize participants with the latest equipment available on the market

The basic premise of this event and accompanying fair is that a global, coherent, and synergistic approach that engages government and society as a whole is needed to meet the challenges posed by the dramatic spread of chemical industries and chemical activities and the accompanying threat of misuse of chemicals. Modern safety and security solutions must be introduced into the supply chain from raw materials to infrastructure to the production, transportation, and use of chemicals at the local, regional, and global levels. A chemical safety and security culture should be promoted globally as part of the overall CBRN culture.

To this end, the session and fair will include three unique concepts. First, they will combine a forum for high-level policy statements and discussions on

Meanwhile, the dramatic growth and dissemination of the global chemical industry in recent decades has made chemical accidents a routine occurrence and increased the risk that toxic chemicals could be intentionally misused to harm people and the environment.



current challenges in enhancing chemical safety and security culture globally, with a multiplicity of practical learning opportunities in the form of workshops, exhibitions, demonstrations, training sessions, and best-practices exchanges. By bringing together the best technological solutions, innovations, and equipment for enhancing chemical safety and security, the summit and fair will help to establish or expand the global market for them.

Second, “CHEM SS 2016” is not a government-led initiative but one that comes from the grassroots level—from those who are directly engaged in enhancing chemical safety and security. While governments support the initiative, they will partner with industry, academia, and civil society in preparing and running the various events at the summit. This multi-stakeholder ownership reflects a consensus that effective responses to chemical threats, whether caused by human error or intentional activities, require a holistic approach that involves both government and society.

Third, “CHEM SS 2016 will be a truly global event, free from political exclusion. It will affirm that chemical threats are global in nature and require global responses, and demonstrate that by putting aside divisive political considerations the international community can act together. The summit will bring together multi-stakeholder audiences from all over the world: governments, national and international regulatory bodies, industry (including chemical associations and private companies), laboratories, international organizations, academia, and NGOs, along with independent experts.

The Chemical Safety and Security Fair will include exhibitions of equipment, technology, software, means of responding to chemical emergencies and chemical releases, and systems, procedures, training, and information to support national and international stakeholders in enhancing chemical safety and security. Exhibitions and demonstrations will focus on (1) risk prediction, planning, and management tools for response operations; (2) safety and security equipment and industry tools for transporting hazardous materials; (3) sampling, analytical instrumentation, procedures, and lab demonstrations; (4) detection, monitoring, warning, and protection equipment; (5) medical countermeasures; (6) search-and-rescue equipment; (7) operational

procedures, training, and education; and (8) food and animal safety and security.

Targi Kielce, the co-organizer with the ICCSS and host for the session and fair, ranks second among all exhibition centers in Central and Eastern Europe as measured by the number of exhibitors and exhibition space rentals. With more than twenty years’ experience in organizing trade fairs, congresses, and other major events, it is the only trade fair center in Poland with an ISO Certificate. Targi Kielce’s vast, modern complex south of Warsaw includes 90,000 square meters of total exhibition space, including 36,000 square meters in seven state-of-the-art pavilions plus additional outdoor exhibition areas. Conference facilities include the Congress Hall auditorium, which accommodates 900 people, and 19 multifunctional conference halls that can be adapted to presenters’ needs. For more information, visit the CHEM SS 2016 website at <www.targikielce.pl/en/chemss.htm>.

CBRN industries and materials are globalizing rapidly and dynamically, but international responses and regulatory mechanisms for prevention of and response to misuse of these agents remain weak. The ICCSS seeks to overcome these weaknesses by promoting a whole-society approach to mitigate the risks of misuse of toxic chemicals at the local and national levels, and by introducing innovative solutions to enhance chemical safety and security at the regional and global levels. “CHEM SS 2016” will institute a process of engaging all stakeholders in the international community in continuous dialogue to ensure that chemistry is used in a safe and secure manner—and exclusively for peaceful purposes.



Biorisk Management Culture

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Biosecurity is a free-standing approach to enhance biorisk management that also incorporates elements of biosafety, ethical responsibility and research excellence. These components overlap, interact and support each other in pursuit of an overall optimal biorisk management system. Biosafety and biosecurity address different risks (unintentional versus intentional), but share a common goal: protect relevant facilities and society by keeping biological materials safely and securely where they are used and stored. Given this overlap, safety and security have common characteristics designed to contribute to their high standards. After a series of laboratory incidents in several countries including the United States and the United Kingdom attributed to deficient culture, there is a need to develop a mechanism which would help assess the impact of the human factor in these vital areas.

Biosafety and biosecurity culture can be defined as an assembly of beliefs, attitudes and patterns of behavior that can contribute to effective biorisk management by supporting biosafety and reinforcing complementary security procedures, rules and practices as well as facilitating relevant professional standards and ethics. The biosafety/biosecurity culture concept is to be based on the widely accepted model of organizational culture which was successfully transformed and used. The purpose of this paper is to apply the experience accumulated in other domains to biorisk management.

A culture is formed by underlying assumptions about reality. Applied to biosafety and biosecurity, this means that personnel display observable behavior and apply management systems in reaction to what they assume about a variety of security related phenomena. The process of building and assessing any culture, like biosecurity culture, is driven by a set of indicators assigned to each characteristic in the model to describe the content of each characteristic. These indicators constitute a framework under which to facilitate biosecurity culture development, promoting wanted and discouraging unwanted behavior (see Appendix).

The purpose of a biosafety/
biosecurity culture assessment is
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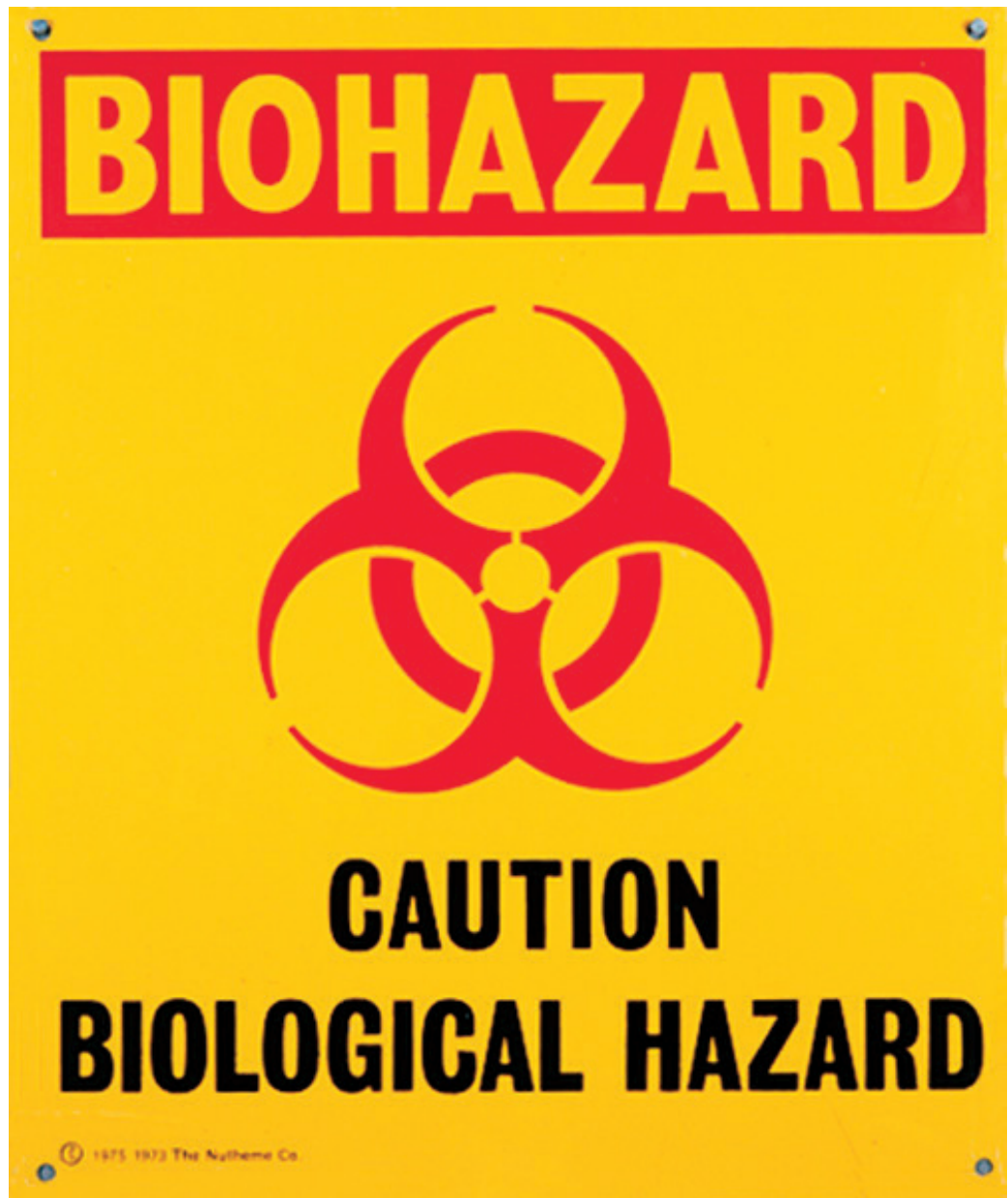
The purpose of a biosafety/biosecurity culture assessment is to provide an accurate picture of the influence of the human factor on an organization's biorisk management regime. Safety and security culture assessment is not an audit; it goes beyond the observed facts and focuses on the analysis of underlying root causes, i.e. beliefs and attitudes that are driving human behavior. Results of

regularly performed self-assessments enable the charting of trends over time as well as the detection and analysis of culture improvement or deterioration. They can provide an early warning to investigate the causes of specific problems that are revealed.

The initial self-assessment establishes a baseline, and subsequent assessments are held both with the use of the same indicators to trace evolution of culture over time, and new ones that identify signs of emerging weaknesses. There is often a lag between the time that weaknesses develop and an event that has significant consequences. By identifying early warning signs through regular self-assessments, corrective actions can often be taken in time to prevent or mitigate breaches.

The self-assessment process is conducted by a carefully selected representative group of staff members and remains inside the organization. Assessment tools include: surveys, interviews, document review, focus groups and observations. Assessments reveal perceptions, beliefs and attitudes of the personnel relevant to biorisk management. The findings may reveal overconfidence or complacency; lack of a systematic approach toward safety and security risks; failure of top management to act as role models; dysfunctional communication channels; conflicting subcultures inside the organization; apathy or ignorance toward safety and/or security; and indifference to the experience of others.

It is important to identify both weaknesses and strengths because the latter can often be used as leverage to address the former. Regularly held self-assessments help move the organization along the learning curve and facilitate management efforts to address safety and security risks. Upon receipt of the self-assessment report, the expectation is that senior managers will draw upon the insight of evaluators to develop an action plan designed to address identified cultural deficiencies. The assessment process, here envisioned, complements The Select Agent Program Personnel Suitability Assessment because existing Select Agent program elements can readily be integrated and synergize with this proposed culture self-assessment. The proposed methodology is not prescriptive and can be easily adjusted to the safety and security needs of individual facilities.

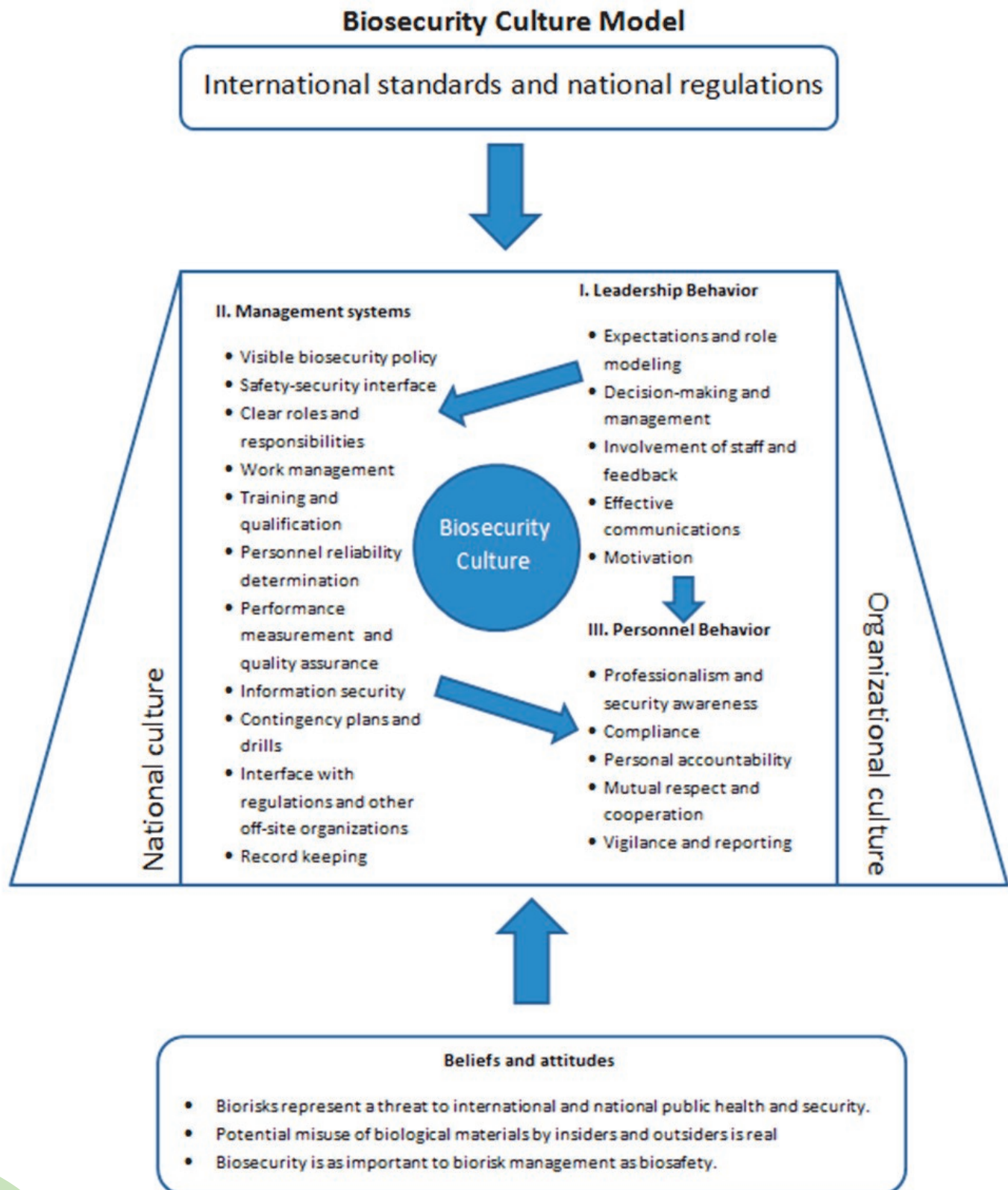


BELIEFS AND ATTITUDES

Without a strong substructure of beliefs and attitudes about existing and potential risks, an effective biosafety and biosecurity culture cannot exist. Efforts to instill such beliefs and attitudes must be carefully calibrated to reach everyone working in the relevant organization; regardless of whether these individuals are directly involved in any safety and/or security related functions. The most important general assumptions for the personnel are that a) biosafety and biosecurity risks represent a threat to international and national public health and



Figure 1: Biosafety and Biosecurity Culture Model



security; b) potential misuse of biological materials by insiders and outsiders is real; c) biosecurity is as important to biorisk management as biosafety. Cognizance that misuse of biological material can have devastating health, environmental, economic, social, and psychological impacts is likely to reinforce the perception that a robust security regime is not only desirable but necessary. Since most people within an organization often have a lot of common experience, they will also hold the same unconscious assumptions about vulnerabilities and consequences which spread and permeate the entire workforce. Top managers are in a position to imbed into the mindset of their personnel biosafety and biosecurity culture inducing beliefs and attitudes.

LEADERSHIP BEHAVIOR

Proactive safety and security leadership helps improve culture awareness at all levels. Leaders play a vital role in dealing with malicious capabilities, unintentional personnel errors, inadequate organizational procedures, and management failures. They can promote new and different assumptions and patterns of thinking, and establish new patterns of behavior, as well as change the physical environment, the mentality and the guiding principles. Culture therefore tends to mirror the real intention, specific actions and priorities of the management. Given the diversity of laboratory types and other organizations, management includes individuals and groups who direct, control, and appraise the organization.

Managers develop individual and institutional values as well as behavioral expectations for the organization to support the implementation of the safety and security management systems and act as role models in the promulgation of these values and expectations. Characteristics of management behavior include: explicitly demonstrated expectations; effective decision-making process and management oversight; involvement of staff and feedback;

effective communication; and motivation tools. Each characteristic is supported by associated culture indicators, samples of which appear in the Appendix at the end of this paper.

MANAGEMENT SYSTEMS

The management systems integrate characteristics that either relate directly to biosafety/biosecurity or are part of the managerial framework without which safety and security cannot be ensured and maintained. These systems are designed and shaped by senior management, consistent with their vision of an effective biosafety and biosecurity culture and the need for appropriate management tools to facilitate and support this process. At the same time,

management systems ensure that health, environment, safety, quality, compliance and economic requirements are not considered separately from biorisk management requirements. The objective is to achieve a risk-based balanced approach. Characteristics of management systems include: visible and effective safety and security policy; the safety-security interface; clear definition of roles

and responsibilities; work management; personnel reliability determination; training and qualification; performance measurement and quality assurance; information security; feedback process; contingency plans and drills; interface with regulators and other off-site organizations; and record keeping. Each characteristic is supported by associated culture indicators, samples of which are listed in the Appendix.

PERSONNEL BEHAVIOR

The ultimate objective of safety and security culture is to develop a set of desired standards of personnel behavior. Biosafety and biosecurity awareness and culture are driven by personnel beliefs that safety and security are necessary. In the absence of an adequate

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security regime biorisks may impact international and national public health and lead to serious social, security, economic, financial, environmental and other consequences. The behavior of safety and security culture conscious personnel includes several key characteristics: safety/security awareness; compliance; personal accountability; mutual respect and cooperation; and vigilance and reporting.

It may take some time for the biosafety/biosecurity culture model to get accepted, refined and implemented as a tool for human capacity building in support of effective biorisk management. This methodology is not prescriptive and leaves much latitude to its users. With appropriate modifications it can be applicable to a wide range of institutions including biological laboratories, diagnostic facilities, regional and national reference centers, public health laboratories, research centers and bioproduction facilities for human, veterinary and agricultural purposes. Though not a panacea, it can enhance the biorisk management regime and contribute to its major objectives. Although the regime has traditionally been built on safety measures, there are factors that are making security distinctly different and challenging. In addressing these challenges, an integrated approach is required to ensure that all responsible organizations have an adequate and compatible culture to establish, implement and sustain biorisk management tasks.

APPENDIX

Sample Characteristics of Biosecurity Culture Model and Associated Indicators

A Characteristic of Leadership Behavior: Expectations and Role Modelling

Leaders must establish performance expectations for biosafety and biosecurity to guide staff in carrying out their responsibilities as well as act as the role model

- Managers are seen to comply with policies, procedures and processes as well as attending and supporting compliance training activities
- Management recognizes distinctively challenging safety and security requirements in use, storage, and transport and consistently addresses them

- Senior management demonstrates a sense of urgency to correct significant safety and security weaknesses or vulnerabilities
- Senior management provides on-going reviews of performance as well as appraises roles and responsibilities to reinforce expectations and ensure that key safety and security responsibilities are being met
- Managers promote bioethical considerations such as transparency of decision-making, public participation, confidence and trust, and responsibility and vigilance in protecting society
- Managers systematically identify relevant compliance obligations and their implications for the research, products and services
- Facility leadership convey the importance of biosafety, biosecurity and personnel reliability through communicating their own personal commitment to those goals

A Characteristic of Managements Systems: Biosafety-Biosecurity Interface

Biosafety and Biosecurity culture address different risks (unintentional versus intentional) but they share a common goal: protect relevant facilities from outsider and insider threats and keep relevant bio material safely and securely where they are used and stored. There are also challenges in their promotion, management, and coordination related to differences in approach and risk perception. An optimal decision-making process requires an integrated concept that ensures the involvement of experts in each discipline on a continuous basis. Safety and security culture issues should be promoted and evaluated on mutually supporting and reinforcing terms.

- Good biosafety practices reinforce and strengthen biosecurity
- Problems concerning the safety and the security are promptly identified and corrected in a manner consistent with their importance and with due regard for their similarities and differences



- Organizational arrangements and communication links are established that result in an appropriate flow of information on the safety and the security at various management and staff levels as well as between them
- While handling dangerous pathogens and toxins, organization ensures that all emergency response personnel, including law enforcement, are aware of the safety issues on-site and procedures to be followed if an incident occurs
- Protective measures are designed and implemented to ensure that they are supportive of and do not have an adverse effect on facility operation and safety
- Research and other activities involve not only addressing the scientific questions underpinning the research but also ensuring that the whole process is conducted in a safe manner and in a security environment
- Procedures are in place to communicate to incoming personnel the particular risks and responsibilities involved in undertaking BSAT research
- Scientists play an active role in the review of relevant protocols in order to protect intellectual rights and participate in determining the benefits and risks, including protection and access to biological material and dangerous pathogens
- The safety and security related documentation is understandable to those who use it
- Document users are aware of and use appropriate, correct, and updated documents
- Projects involving biological agents and toxins are evaluated for their dual-use potential at the inception of any research and throughout the research process
- Measureable objectives for implementing the safety and security-related goals, strategies, and plans are established through appropriate processes

Management System: Clear Roles and Responsibilities

Members of all organizations need a clear understanding of “who is responsible for what” in order to achieve the desired results. A significant part of establishing an effective security management is the clear definition of roles and responsibilities. It is particularly important to review and update this system when organizational change is being planned and executed.

- Procedures are in place to define the roles, responsibilities and authorities of the personnel who handle, use, store, transfer and/or transport relevant material
- Staff members understand potential biorisks well enough to accept their roles and responsibilities
- Staff members know why they are assigned safety and/or security-related functions, how these functions fit into a broader picture, and what impact their noncompliance may have on the organization







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