WMD Non-Proliferation and CBRN Defense*

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Abstract

Since after the September 11 terrorist attack in the United States, the nature of threat caused by nuclear, biological and chemical (NBC) weapons changed substantially from that in the past. In addition the preparation for the possible military attack with NBC weapons in the traditional context of nation-to-nation, international community began to review the need for defending against the threat of chemical, biological, radioactive, and nuclear (CBRN) attack by non-state actors including international terrorists. In fact, the fear of the vertical/horizontal proliferation of weapons for mass destruction (WMD) could, by extension, serve as a source of CBRN threats, should NBC weapons be used in state-to-state conflict or as a target or means of terrorist attack. In this regard, combatting WMD proliferation through the series of multi-layered internationally coordinated efforts will lead to reducing CBRN threats that could manifest today or in the future. However, those non-proliferation approaches alone will not avert the risk of state and non-state actor using WMD, or of non-weaponized CBRN assets being turned into means of targets of attack. As a general trend, the spectrum of CBRN defense is extremely broad, and the causes of CBRN situations are also broad in scope, ranging from armed conflict, terrorism and natural disaster, to accident. In this sense, existing CBRN scenarios based on the past occurrence represents a momentous challenge to the government and all other domestic sectors. The development of effective mechanisms against such CBRN threats is a priority not only in the case of the ROK and China, which were argued in this paper, but also across the globe.

Introduction

Weapons of mass destruction (WMD) were introduced to the battlefield as modern weaponry in the 20th century, and developed into highly sophisticated weapons assisted by the advances in their means of delivery. Following the World War II and the Cold War era, vertical and horizontal proliferation of WMD occurred all over the world. Consequentially, WMD, to this very day, pose serious impacts to the international security environment. The international community's steps to counter the proliferation of WMD have consisted of multilayered steps, namely: non-proliferation regimes based on multilateral treaties; effective non-proliferation measures through a coalition

* Originally published in Japanese in *Boei Kenkyusho Kiyo* [NIDS Security Studies], Vol. 16, No.1, November 2013. Some parts are updated and expanded.
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of the willing; non-proliferation measures pursuant to United Nations (UN) Security Council resolutions; and export control regimes.

Meanwhile, the international security paradigm changed dramatically after the September 11 terrorist attacks in the United States in 2001. This brought with it a new serious concern: the proliferation of WMD to non-state actors, including terrorists.[1] These changes raised the awareness of the international community that the threat of WMD was no longer limited to the fear of actual use of nuclear, biological, and chemical (NBC) weapons[2] as a means of attack on the battlefield, that WMD represented a larger spectrum of risks. Accordingly, countries began to review the need for defending against the threat of chemical, biological, radiological and nuclear (CBRN) terrorism scenarios[3] as well as any other possible CBRN incidents, including cases caused by accidents and natural disasters. Specifically, it has been widely acknowledged that effective responses are necessary for the environmental release of and contamination from hazardous materials (HAZMAT) or dangerous goods (DG) generally found in industrialized societies.

In the conventional context, it was essential that all states take effective measures against NBC weapons in light of the threat of WMD proliferation. However, such measures are insufficient for contemporary CBRN threats that entail a broad spectrum of risks. Comprehensive responses are needed which take into account a wider scope of threats, such as regional conflict, asymmetric warfare, and catastrophic acts of terrorism, coupled with rapid advancements in science and technology and the proliferation of knowhow that lead to mass destruction.[4] In short, CBRN defense is a concept that is broad in scope and refers to a comprehensive set of measures taken to deal with various CBRN scenarios that could take place in reality, implemented through the coordination of various sectors of society.

In general, when a CBRN situation arises, responses will need to be taken according to the steps of the crisis management cycle, albeit the responses will be affected by the nature of the threat as well as the scale of the damages. Such steps will include notification, evacuation direction, zoning, establishment of no-entry areas, detection, decontamination, triage, medical countermeasures, and reconnaissance. The responses will be undertaken primarily by first responders, i.e., HAZMAT

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1 For convenience, this paper uses the definition of terrorism adopted in the written response of the High-Level Panel on Threats, Challenges and Change that became the basis of the 2005 Report of the UN Secretary-General on UN reform: "Any action constitutes terrorism if it is intended to cause death or serious bodily harm to civilians or non-combatants with the purpose of intimidating a population or compelling a Government or an international organization to do or abstain from doing any act." Naofumi Miyasaka, "Kokuren no Tero Taisaku [The United Nations's Action to Counter Terrorism]," Yoshikazu Hirose and Naofumi Miyasaka, eds., *Tai Tero Kokusai Kyoryoku no Kozu: Takokukan Renkei no Seika to Kadai* [Composition of International Cooperation Against Terrorism: Achievements and Challenges of Multilateral Coordination], Minerva Shobo, 2010, pp. 22-23.

2 WMD and NBC weapons essentially refer to the same weapons. In this paper, however, weapons that cause mass destruction and decimation will be identified primarily as WMD in the context of non-proliferation and as NBC (weapons) in the context of means of military attack.

3 In recent years, explosives have been added to the list, mainly from a counterterrorism point of view. Thus, such threats are sometimes collectively referred to as "CBRNE." In Japanese government documents and other materials, "NBC" is often used instead of "CBRN." This paper focuses on efforts for responding to scenarios involving the use of WMD (NBC weapons) as well as a variety of wide-ranging situations resulting from chemical, biological, radiological and nuclear threats, including terrorism, accidents, disasters, and pandemics. Unless stated otherwise, "CBRN" is used in this paper.

4 Han H. Kühl, *Defense: Protection against Chemical, Biological, Radiological and Nuclear Threats in a Changing Security Environment,* Frantfurter Allgemeine Buch, 2012, pp. 24-26.

specialists from the police and fire department, and teams with specialized knowhow, such as the Disaster Medical Assistance Team (DMAT). If the CBRN situation is beyond the capabilities of first responders, then the military will likely be assisting or will be involved, either directly or indirectly. But in principle, CBRN defense presumes that a variety of sectors, including the government, relevant organizations, companies, and volunteers, is coordinating and collaborating with the response effort, and therefore, has a strong domestic governance component.[5]

The threat of the proliferation of WMD across state borders could, by extension, serve as a source of CBRN threats, should NBC weapons be used in state-to-state warfare or as a target or means of a terrorist attack. In this regard, combatting WMD proliferation will also lead to reducing CBRN threats that could manifest today or in the future.

From this recognition, this paper attempts to examine from an array of angles the regional proliferation situation, trends in present threats, and states' efforts, based on the two themes of WMD non-proliferation and CBRN defense. Section 1 reviews the four approaches to WMD non-proliferation carried out by the international community. Section 2 discusses the trends in present CBRN threats, examining the C, B, R, and N elements individually by referring to preceding studies. Section 3 outlines the recent trends in WMD proliferation in East Asia, mainly focusing on nuclear proliferation by taking the examples of North Korea and Myanmar. Lastly, Section 4 elaborates on a few examples of the WMD non-proliferation and CBRN defense approaches taken in key East Asian states — the Republic of Korea (ROK) and China.

Four Approaches to the Non-Proliferation of WMD

Today's efforts to stop the proliferation of WMD — nuclear weapons, chemical weapons, biological weapons, and their means of delivery — may be broadly categorized into four approaches: (1) international non-proliferation regimes based on bilateral and multilateral treaties; (2) coalition of the willing; (3) gentlemen's agreements not based on treaties and other arrangements; and (4) WMD non-proliferation pursuant to UN Security Council resolutions.

The Nuclear Non-Proliferation Treaty (NPT) is generally considered to be one of the fundamental international regimes in (1) against nuclear weapons.[6] Entering into force in 1970, the NPT provides a nomative and legal framework for nuclear disarmament, nuclear non-proliferation, and the right to peaceful uses of nuclear energy. The Convention on the Physical Protection of Nuclear Material was entered into force in 1987.[7] Notably, the Convention obligates States Parties to ensure the safety of the international transport of nuclear material, aimed at preventing the illegal acquisition and use of nuclear material (in 2005, the Amendment to the Convention on the Physical Protection of Nuclear Material was adopted by consensus; the Amendment expanded the scope of the Convention to nuclear facilities and material in domestic transport, use, as well as storage). Additionally, the International Convention for the Suppression of Acts of Nuclear Terrorism entered into force in 2007. The Convention criminalizes possession

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5 Recent years have seen a rise in international CBRN cooperation. Due to space limitations, however, this paper will leave it to other papers to discuss international CBRN cooperation efforts.

6 Jozef Goldblat, *Arms Control: A Guide to Negotiations and Agreements*, trans. Masahiko Asada, Nippon Hyoron Sha, 1999, p. 67.

7 Encyclopedia ATOMICA, *Convention on the Physical Protection of Nuclear Material (13-04-01-02)* <http://www.rist.or.jp/atomica/data/dat_detail.php?Title_Key=13-04-01-02>.

and use of radioactive material and nuclear explosive device, and provides for the punishment of offenders as well as cooperation for the extradition of offenders.

Furthermore, treaties of regional nuclear-weapon-free zone (NWFZ) have been playing a significant role in international politics on nuclear disarmament and non-proliferation. These treaties which indirectly contribute to nuclear non-proliferation and nuclear disarmament in the specified areas have the following points in common[8]: (i) they prohibit the development, manufacturing, testing, possession, and deployment of nuclear weapons; (ii) they prohibit the use and the threat of the use of nuclear weapons against the zones; and (iii) they prevent violations of the (NWFZ) treaties and provide for the establishment of compliance commissions for dispute settlement. The NWFZ treaties are: the Tlatelolco Treaty signed in 1967 comprised of the Latin American and Caribbean NWFZ; the Treaty of Rarotonga signed in 1986 comprised of the South Pacific NWFZ; the Bangkok Treaty signed in 1995 comprised of the Southeast Asian NWFZ; the Treaty of Pelindaba that opened for signature in 1996 and entered into force in 2009 comprised of the African NWFZ; and the Treaty on a Nuclear-Weapon-Free Zone in Central Asia newly passed in 2006 comprised of the five countries of Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan. With respect to bilateral treaties, the New Strategic Arms Reduction Treaty (New START), which entered into force between the United States and Russia in 2011, plays a vital role for future nuclear non-proliferation, arms control, and disarmament, as it serves as proof[9] that the United States and Russia are obeying the obligation in Article 6 of the NPT, which is essentially at the heart of the nuclear non-proliferation regime, i.e., the obligation on nuclear-weapon states to move towards nuclear disarmament.

Conversely, there are treaties which have not entered into force but are nevertheless critical for nuclear non-proliferation and future nuclear disarmament, similar to the above multilateral and bilateral treaties. These are the Comprehensive Nuclear-Test-Ban Treaty (CTBT) and the Fissile Material Cut-off Treaty (FMCT). According to an assessment in a recent report, CTBT achieved nuclear test monitoring and verification capabilities that can remotely detect seismic waves generated by nuclear explosions of 1 kt or below at 90% confidence levels.[10] The CTBT has not entered into force since eight countries (whose ratification are required by the CTBT for its entry into force) have still not signed and ratified the treaty, namely, the United States, China, Egypt, Iran, Israel, India, Pakistan, and North Korea. The principal objective of an FMCT is to freeze the nuclear weapon development capabilities of the five nuclear-weapon states defined in the NPT (the United States, the United Kingdom, China, Russia, and France; all have stopped production of highly-enriched uranium [HEU] and plutonium for weapons) and of the non-NPT members (India, Pakistan, and Israel; India and Pakistan continue to produce HEU and plutonium for weapons; the details on Israel are unknown).[11] The uranium enrichment of North Korea which

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8 Hiromichi Umebayashi, *Hikakuheikichitai: Kakunaki Sekai eno Michisuji* [Nuclear-Weapon-Free Zone: Roadmap for a Nuclear Free World], Iwanami Shoten, 2011, p. 4.

9 Mitsuru Kurosawa, *Kaku Gunshuku to Sekai Heiwa* [Nuclear Disarmament and World Peace], Shinzansha, 2011, p. 79.

10 Committee on Reviewing and Updating Technical Issues Related to the Comprehensive Nuclear Test Ban Treaty, *The Comprehensive Nuclear Test Ban Treaty: Technical Issues for the United States*, The National Academies Press, 2012, p. 1.

11 Arms Control Association, "Factsheets: Fissile Material Cut-off Treaty (FMCT) at a Glance," August 2012 <http://www.armscontrol.org/factsheets/fmct>.

withdrew from the NPT will also likely be subject to an FMCT. Although negotiations on an FMCT have not yet begun, the treaty is expected to: (a) prohibit the production of HEU and plutonium for the research, manufacturing, and use of nuclear explosive devices; and (b) prohibit assisting other countries in HEU and plutonium production for said purposes.[12] While on the one hand the United States has traditionally worked to further narrow the list of fissile materials covered by the treaty in order to reduce verification costs, Pakistan has urged for the expansion of the list due to concerns that an FMCT would lock the nuclear fissile material stockpile of its neighbor, India. In order for negotiations to begin on an FMCT, the key question will be how to close the differences in understanding between the countries concerned.[13]

Turning to the steps to prevent the proliferation of biological and chemical weapons, there is first the 1925 Geneva Protocol, which prohibits the use of asphyxiating, poisonous or other gases and bacteriological methods in war. Also, there are multilateral treaties, such as the Biological Weapons Convention (BWC) (entered into force in 1975), which has 170 States Parties and prohibits the manufacturing, development, and possession of biological and toxic weapons. The Chemical Weapons Convention (CWC) (entered into force in 1997), which has 190 States Parties, establishes a comprehensive prohibition on the development, production, and possession of chemical weapons with effective verification measures, and provides for the abolition of existing chemical weapons within a given period.

As regards (2), the "coalition of the willing" category, an example is the Proliferation Security Initiative (PSI). Launched in 2003, PSI coordinates the measures of participating states, within the scope of their respective domestic laws and international law, to stop the proliferation of WMD, missiles, and related materials by jointly interdicting their transfer and transport based on the Statement of Interdiction Principles. A total of 102 countries participate in PSI and have conducted ground, naval, and air interdiction exercises. However, many challenges stand in the way of effective interdiction, especially air interdiction. Some analysts point to PSI as one of the factors causing the obscureness surrounding the North Korean and Iranian proliferation of WMD.[14] Apart from the PSI, some observers identify the recent promotion of nuclear counterterrorism measures through the Nuclear Security Summit as a new example of the coalition of the willing in this area.[15]

As for (3), examples include the Zangger Committee,[16] a gentlemen's agreement-type body launched in 1971 to review the specific scope of, as well as control the exports of, the nuclear material, equipment, and facilities subject to the supply regulations in Article 3, Paragraph 2 of the NPT. Another example are the efforts of the Nuclear Suppliers Group (NSG)[17] launched in

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12 Ministry of Foreign Affairs of Japan, *Heikiyo Kakubunretsusei Butshi Seisan Kinshi Jyoyaku (Katto Ofu Jyoyaku: FMCT)* [Fissile Material Cut-off Treaty] <http://www.mofa.go.jp/mofaj/gaiko/kaku/fmct/>.

13 Arms Control Association, Ibid.

14 Comments shared by Prof. Takehiko Yamamoto, Graduate School of Waseda University, who was a guest lecturer at a seminar held at NIDS. July 31, 2012.

15 George P. Shultz et al., "Next Steps in Reducing Nuclear Risks: The Pace of Nonproliferation Work Today Doesn't Match the Urgency of the Threat," *Wall Street Journal*. March 5, 2013.

16 Ministry of Foreign Affairs of Japan, *Zangaa Iinkai (Gaiyo)* [Zangger Committee (Overview)] <http://www.mofa.go.jp/mofaj/gaiko/fukaku/zangger.html>.

17 Ministry of Foreign Affairs of Japan, *Genshiryoku Kyokyukoku Guruupu no Gaiyo* [Overview of the Nuclear Suppliers Group] <http://www.mofa.go.jp/mofaj/gaiko/kaku/nsg/>.

1975, which controls the exports of not only nuclear goods, but also dual-use goods and related technology based on independently developed guidelines. Notably, the NSG conducted discussions on revising its guidelines to make an exception for India, an NPT non-member, to allow for the exports of nuclear fuel and nuclear technology to the country under the 2008 U.S.-India nuclear cooperation agreement. The NSG ultimately approved the revised guidelines by consensus. Though the pretext was "gentlemen's agreements," they dealt with crucial issues closely associated with the future of international norms on nuclear non-proliferation. In this regard, it cannot be denied that export control itself has become a platform for subtle inter-state political gamesmanship. Some analysts say export controls are realistic only through policy coordination in bilateral or multilateral contexts.[18] Gentlemen's agreements for weapons other than nuclear weapons include the efforts of the Australia Group (AG) (1984 to present), an export control framework concerning biological and chemical weapons comprised of 42 suppliers.[19]

On the other hand, steps to combat nuclear terrorism — a new threat driving the proliferation of WMD — and steps to counter the proliferation of nuclear weapons and nuclear-related goods to states and non-state actors include measures that fall under category (4). They are measures, such as the UN Security Council Resolution 1540 (2004) and the series of Security Council resolutions on the nuclear issues of North Korea and Iran. Security Council Resolution 1540, in particular, calls on all UN Member States to develop and implement appropriate domestic legislation to prevent the proliferation of WMD to non-state actors, including terrorists, in accordance with Chapter VII of the UN Charter. It was an entirely new, norm-building approach that took into account both effectiveness and immediacy of results.[20]

In any case, not all countries have signed or ratified the international non-proliferation regimes in (1) symbolized by the NPT, CWC, and BWC. Moreover, there are clearly countries that distance themselves from the coalition of the willing approach in (2). The export control regimes and other arrangements in (3) are gentlemen's agreements and have no legal binding force. WMD proliferation prevention based on UN Security Council resolutions in (4) has legal binding force on UN Member States, and in this sense, has more advantages with regard to effectiveness and the quickness of response than the approaches in (1) to (3). Be that as it may, knowhow on WMD is diffusing as time passes. Furthermore, with the dramatic advancements in science and technology, there is a concern that the threshold of state actors and non-state actors accessing WMD may be falling from the threshold that was previously understood. It goes without saying that the approaches in (1) to (4) must be advanced in a multilayered and continuous manner based on multilateral coordination, and that the universality of the approaches, including outreach activities, must be increased. That said, these series of WMD non-proliferation approaches alone will not avert the risk of state and non-state actors using WMD, or of non-weaponized CBRN assets being turned into means or targets of attack. Based on the relevant understanding, the next section examines the specific trends in CBRN threats, according to each of the C, B, R, and

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[18] Morikuni Makino, "Kakuheiki Kanren no Yushutsu Kanri Regiimu [Export Control Regimes Related to Nuclear Weapons]" Masahiko Asada, ed., *Heiki no Kakusan Boshi to Yushutsu Kanri: Seido to Jissen* [Proliferation Prevention and Export Control of Weapons: Arrangements and Practice], Yushindo, 2004, p. 40.

[19] Ministry of Foreign Affairs of Japan, *Osutoraria Guruupu no Gaiyo* [Overview of the Australia Group] <http://www.mofa.go.jp/mofaj/gaiko/bwc/ag/gaiyo.html>.

[20] Sukeyuki Ichimasa, "Norm Building by the UN Security Council: UNSCR 1540 and Governance of WMD Non-Proliferation," *International Relations*, No. 155, 2009, pp. 70-71.

N elements.

Recent Trends in CBRN Threats

WMD non-proliferation and CBRN defense are similar at first glance but are actually quite different. In this regard, drawing links between these two may warrant further discussion. This is made even more strikingly clear when one considers WMD non-proliferation in particular. WMD non-proliferation measures aim to control weapons that make mass destruction feasible, as well as prevent the vertical and horizontal proliferation of weapons. Conversely, CBRN defense measures take into consideration responses not only to armed and terrorist attacks that utilize NBC weapons, but also to accidents and other incidents causing the release of HAZMAT and DG. While they have similarities in that they are both sources of threats, the objectives and means of the respective measures are quite dissimilar. Nevertheless, from the standpoint of CBRN defense, combatting WMD also has important implications for CBRN defense as a measure to reduce the risk of WMD attacks, which have the most fatal consequences.

Especially since the September 11 terrorist attacks in the United States, the concern has not only been about the risk of terrorists and other non-state actors accessing WMD. The risk of the use of non-weaponized CBRN assets, such as HAZMAT and DG, as a means of a terrorist attack is a deeply rooted concern that one cannot easily dispel. Under the scope of CBRN defense, responses need to take into account NBC weapon attacks in a state-to-state context, and terrorist attacks utilizing CBRN assets, as well as to HAZMAT-related accidents and disasters and disease outbreaks, which is also a public health matter. Against this backdrop, the next section discusses the trends in CBRN threats in more detail.

Biological weapons and biological threats

In recent years, the increase in biological threats represent a growing concern for the international community. Such concern has been fueled by the revelation of Al-Qaeda's plans to conduct anthrax attacks, as well as by the many challenges confronting the U.S. technology and system to defend against and detect deadly agents.[21] In the case of the former, it has become apparent that conventional preparedness against WMD terrorism, i.e., responses to the release of HAZMAT into the environment, will not suffice for detecting, treating, and investigating biological threats. This point was made clear by the anthrax-laced letter incidents in the United States in 2001.[22] With regard to the latter, the re-emergence of eradicated pathogens such as smallpox and the risks of such pathogens falling into the hands of terrorists are causing growing alarm. It had been considered a technological hurdle to weaponize biological agents, which entail processing agents to disseminate aerosol, making them suitable for transport. However, a new approach was demonstrated, which was to place anthrax into an envelope and use the postal network to conduct an attack, similar to the 2001 anthrax attacks in the United States.[23] This in turn is giving

[21] See the presentation made by the U.S. Army chemical weapons officer and others at the CBRN-E Asia Pacific 2012.

[22] Arnold M. Howitt and Robyn L. Pangi, "Intergovernmental Challenges of Combating Terrorism," Arnold M. Howitt and Robyn L. Pangi, eds., *Countering Terrorism: Dimensions of Preparedness*, The MIT Press, 2003, p. 47.

[23] See the presentation made by the U.S. healthcare professional at the CBRN-E Asia Pacific 2012.

rise to concerns about terrorists using such approaches. This is one of the important points for understanding today's biological threats. In 2013, envelopes containing ricin were sent to Barack Obama, President of the United States, and others. It cannot be denied that the spread of low-cost methods of CBRN attacks, including copycat crimes, poses a grave risk to the world.

The heightened concern over biological threats is, furthermore, underpinned by the increasing dual use dilemma associated with the rise of synthetic biology and synthetic genomics. In 2002, after researchers and others at the State University of New York at Stony Brook succeeded in the artificial synthesis of the poliovirus, the genome that was created in the synthesis process began to produce infectious virus particles. This prompted an instant surge of international fear regarding the risks that could manifest, should terrorists exploit this same technology to synthesize more deadly viral agents.[24] According to Jonathan B. Tucker, advances in biotechnologies and increased access to relevant new technical channels help non-state actors overcome existing technical hurdles and could allow for more destructive attacks. Even at the level of state actors, such developments could lead to the "weaponization" of viruses as biological weapons and could change the mode of large-scale production of biological agents.[25]

Defenses against biological weapons require medical countermeasures, detection, surveillance, and physical protection. Despite such circumstances, there will not be, in reality, a constant sufficient stockpile of vaccines and preventive agents for the variety of pathogens, bacteria, and toxins.[26] In addition, the dramatic progresses in genetic engineering, as symbolized by the aforementioned synthetic biology, have made medical measures ineffective. Further still, concerns are rising over the creation of powerful pathogens that cannot be detected by existing detectors.[27]

It should be kept in mind that biological threats are not constrained to terrorism or state-to-state contexts. For example, the natural outbreak of the Ebola virus disease, which killed more than 5,000 people in West Africa as of 2014 due to the spread of infection, is garnering international attention. While such situations caused by pandemics have different processes leading to their outbreaks from the devastations wreaked by interstate warfare employing bioterrorism or biological weapons, the two cases have many commonalities from the standpoint of effective responses. In other words, the responses for combating biological threats are consistent: preventative measures to avoid an epidemic need to be taken; the threat needs to be detected early; and medical or non-medical countermeasures need to be taken.

The threat of chemical weapons

Recently, a U.S. study of Aum Shinrikyo's Matsumoto sarin attack and Tokyo subway sarin attack has stirred up discussion among analysts. The study assessed that developing biological weapons requires a certain level of specialized knowledge, while developing chemical weapons is sufficiently

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24 Jonathan B. Tucker, "Introduction," Jonathan B. Tucker, ed., *Innovation, Dual Use and Security: Managing the Risks of Emerging Biological and Chemical Technologies*, The MIT Press, 2012, pp. 4-5.

25 Ibid., p.6.

26 Gregory D. Koblentz, *Living Weapons: Biological Warfare and International Security*, Cornell University Press, 2009, pp. 28-30.

27 U.S. Department of Defense, "Chemical and Biological Defense Program 2010 Annual Report to Congress," June 2010, p. 3.

possible through literature studies.[28] This was a groundbreaking firsthand study which, for the first time, shed light on the development of chemical weapons, such as sarin, VX nerve agent, hydrogen cyanide, and chlorine gas, as well as of biological weapons, such as Clostridium botulinum and Bacillus anthracis, based on interviews with the imprisoned members of Aum Shinrikyo. One of the major findings of the study was that chemical weapons are easier for terrorists to develop than biological weapons due to the accessibility of the literature on the development of the respective weapons.[29] Another case that adopted a similar approach as this study is Anthony T. Tu's research, which was conducted through the exchange of letters with the Aum Shinrikyo's members in prison. Tu examined the development process of the so-called most powerful nerve agent VX, as well as the background behind the adoption of sarin as a means of terrorist attacks.[30] Tu's study revealed that the cult members' development of the nerve agent VX was realistically possible at the time of orchestrating the attacks. The findings once again drove home the point that the series of Aum Shinrikyo's attacks cast a shadow over previous assessments of the risks of non-state actors' use of NBC weapons.

The international community was reminded about the threat of chemical terrorism by Aum Shinrikyo as well as by an article in Al-Qaeda's outreach magazine *Inspire*. The article urged followers to launch attacks using weapons that allow for mass killings, such as poison.[31] In this regard, it is not an overstatement to say that the threat of terrorists acquiring and using chemical weapons still poses a serious risk. The spectrum of threats is further expanded if one considers not only the threat of chemicals being used for terrorism, but also the release of toxic industrial chemicals (TICs), such as HAZMAT, due to accidents and disasters.[32]

From the context of WMD non-proliferation, the following may be identified as key points at issue. In recent years, fears are growing that a destabilization of the domestic situation, a transition in the political system, and other situations would lead to the actual use of chemical weapons, including domestic stockpiles of sarin, as seen from the example of Syria.[33] Additionally, chemical agents not included in the scheduled chemicals of the CWC, such as the so-called new nerve gas Novichok agents, represent an increasing concern for the international community from the context of non-proliferation.[34] Moreover, there is an argument which applies to both the biological threat discussed earlier as well as to the threat of chemical weapons. That issue is that it is unforseeable when states, which develop vaccines as part of their biodefense programs in preparation for biological weapon attacks, and therefore, possess pathogens, toxins, or chemical agents as samples for analyses and research, will change sides and become proliferators of biological and

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28 Richard Danzig, Marc Sageman, Terrance Leighton, Lloyd Hough, Hidemi Yuki, Rui Kotani and Zachary M. Hosford, *Aum Shinrikyo: Insights Into How Terrorists Develop Biological and Chemical Weapons*, Center for a New American Security, July 2011, p. 33.

29 Ibid., pp. 35-36.

30 Anthony T. Tu, *Sarin Jiken: Kagakusha no me de Tero no Shinso ni Semaru* [Sarin Attacks: A Scientist's Perspective on the Truth Behind Terrorism], Tokyo Kagaku Dojin, 2014, pp. 90-96.

31 NTI, "Al-Qaeda Magazine Urges Chemical, Biological Strikes Against Foes," *Global Security Newswire*, May 3, 2012.

32 U.S. Department of Defense, "Chemical and Biological Defense Program 2010 Annual Report to Congress," p. 2.

33 "Report: Syrian Officials Claim Chlorine, Saline Mix Used in Aleppo Attack," *CNN*, March 25, 2013.

34 OPCW, "Report of the Sixteenth Session of the Scientific Advisory Board," April 6, 2011, p. 7.

chemical weapons.[35]

The threat of nuclear weapons and radiological weapons

There have been various debates on the threat of nuclear weapons and radiological weapons in earlier studies. This paper, at the outset, identifies two types of nuclear terrorism which differ fundamentally from each other in nature and scale of impact vis-à-vis their destructive power and killing power. The two types are: nuclear terrorism which employs nuclear weapons, including improvised nuclear devices (IND); and nuclear terrorism which employs terrorist attacks on nuclear power plants (nuclear plant terrorism), radiological weapons, or radiological dispersal devices (RDD).

Since the 9.11 terrorist attacks in the United States, Graham Allison has promoted the awareness of practitioners, researchers, and others of the potential risks of nuclear terrorism. The argument he presented has no doubt had important worldwide implications through today. Allison contends that nuclear terrorism will ultimately become a "preventable threat" if states: make the prevention of nuclear terrorism an absolute priority; fight a strategically focused war on terrorism; conduct a humble foreign policy; build a global alliance; strengthen intelligence capabilities; enhance the ability to deal with the use of nuclear weapons, INDs, and RDDs; and construct a multilayered defense.[36] In response to this argument, Michael D. Intriligator and Abdullah Toukan described that the threat of nuclear terrorism is real and difficult to thwart.[37] As evidence of this, Intriligator and Toukan point to: the stance of Al-Qaeda that declared it would kill four million Americans; the possibility that nuclear proliferation benefits developed by the A.Q. Khan network in Pakistan have spread to terrorist organizations with abundant economic resources; and the weak defense of the United States against CBRN attacks. Some analysts say that while the risk of nuclear terrorism is not zero, Al-Qaeda's interest in WMD, for example, is not necessarily linked directly to their acquisition of CBRN attack capabilities. These analysts suggest that the threat of CBRN attacks by terrorists should not be overblown.[38] Be that as it may, both the 2009 speech by President Obama in Prague[39] and the 2010 Nuclear Posture Review Report of the United States viewed nuclear terrorism as the most immediate threat.[40] In general, nuclear terrorism is assumed to refer to the following four cases: (1) the theft and detonation of a nuclear weapon; (2) the fabrication and use of an IND that is made to cause a nuclear explosion using a stolen nuclear weapon or nuclear fissile material; (3) attacks against and sabotage of nuclear facilities, including nuclear power plants; and (4) the use of a RDD — a dirty bomb — that does

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35 Koblentz, *Living Weapons: Biological Warfare and International Security*, pp. 237-238.

36 Graham Allison, *Kaku Tero: Ima Koko ni aru Kyofu no Shinario* [Nuclear Terrorism: The Ultimate Preventable Catastrophe], trans. Nobumasa Akiyama, Hirofumi Tosaki, Junko Horibe, Nihon Keizai Shimbun, Inc., 2006, pp. 213-214.

37 Michael D. Intriligator and Abdullah Toukan, "Terrorism and Weapons of Mass Destruction," Peter Katona, Michael D. Intriligator and John P. Sullivan, eds., *Countering Terrorism and WMD: Creating a Global Counter-Terrorism Network*, Routledge, 2006, pp. 69-73.

38 Jez Littlewood and John Simpson, "The Chemical, Biological, Radiological and Nuclear Weapons Threat," Paul Wilkinson, ed., *Homeland Security in the UK: Future Preparedness for Terrorist Attack since 9/11*, Routledge, 2007, p. 59.

39 "Remarks by President Barack Obama, Hradcany Square, Prague, Czech Republic," The White House Office of the Press Secretary, April 5, 2009.

40 U.S. Department of Defense, "Nuclear Posture Review Report," April 2010, p. 3.

not involve nuclear fission.[41]

Out of the four cases, there are various views on (1) and (2), as was discussed at the beginning of this section. According to the International Atomic Energy Agency (IAEA), however, as many as four cases of smuggling of weapons-grade HEU were reported in 2011 alone.[42] Furthermore, new entrants into nuclear power generation[43] have worrisome, fragile physical protection and nuclear security situations that could result in the theft of their nuclear fissile material by terrorists. In this regard, the presence of new entrants is another issue that cannot be neglected. Of course, the importance of reducing such risks fundamentally through the universalization of the NPT regime and through multilayered nuclear non-proliferation measures is indisputable.

As for (3), there is a view that the 2011 Fukushima Daiichi Nuclear Power Station accident in Japan gave terrorists a tip on new modes of attacking a nuclear plant.[44] This view needs to be taken seriously. No matter how solid a nuclear reactor building may be, if capabilities to supply power to a reactor are robbed by an external factor, havoc would be wreaked on the reactor's operations. Regardless of whether the external factor is assumed to be an armed attack by a foreign country, a stand-off attack by a terrorist, or damages and destruction caused by a natural disaster, nations with nuclear power plants need to urgently implement appropriate measures based on their responsibility for nuclear security. Indeed, to deal with the theft of nuclear material and attacks against and sabotage of nuclear facilities, states are strengthening their controls, including by their domestic security authorities and regulatory agencies. A variety of approaches are being taken to enhance the effective nuclear terrorism prevention capabilities of states and to build their nuclear security culture, through force-on-force exercises, desktop exercises, measures against internal threats, and other efforts.[45] Nevertheless, these initiatives have no visible goal. A major challenge is thus maintaining tension as well as sustaining continuous nuclear security and nuclear power safety over the long term.

In the case of (4), as was explained in the case of (3), the risk assessments could have changed between before and after the accident at Fukushima Daiichi Nuclear Power Station. The detonation of an RDD is assumed to result in a wide range of consequences depending on its type and size. However, many experts would agree that its geographical damage would be kept to a localized area, and that its impact on the human body would be a long-term increased risk of cancer due to radiation exposure.[46] As a nuclear terrorism case, the fatality rate in the immediate aftermath of the event as well as its economic loss may be relatively small compared to cases (1),

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41 Charles D. Ferguson and William C. Potter, *The Four Faces of Nuclear Terrorism*, Routledge, 2005, p. 3; Wyn Q Bowen, Matthew Cottee and Christopher Hobbs, "Multilateral Cooperation and the Prevention of Nuclear Terrorism: Pragmatism over Idealism," *International Affairs*, Vol. 88, No. 2, 2012, pp. 350-351.

42 IAEA, "Incident and Trafficking Database Fact Sheet."

43 Steven E. Miller and Scott D. Sagan, "Nuclear Power without Nuclear Proliferation?" *Daedlus*, Fall 2009, pp. 7-18.

44 Interview with Dr. Christopher Hobbs of King's College London and Jasper Pandza, IISS Research Analyst (March 12-16, 2012).

45 Matthew Bunn, Eben Harrel and Martin B. Malin, "Progress on Securing Nuclear Weapons and Materials: The Four-Year Effort and Beyond," Harvard Kennedy School Belfer Center for Science and International Affairs, March 2012 <http://live.belfercenter.org/files/Progress_In_The_Four_Year_Effort_web.pdf>.

46 Federal Emergency Management Agency, DHS, "Planning Guidance for Protection and Recovery Following Radiological Dispersal Device (RDD) and Improvised Nuclear Device (IND) Incidents," *Federal Register*, Vol. 73, No. 149, August 1, 2008, p. 45030.

(2), and (3) above. Nonetheless, if the core principle of terrorism is likened to the definition "an act of violence that is intended to send a message to society and gives greater priority to psychological impact than physical harm," [47] then it is difficult to under-evaluate the psychological impacts of (4), also when one considers the situation in Japan following the Fukushima Daiichi Nuclear Power Station accident.

In any case, there remains undeniable gaps between the responses and capabilities of each state to maintain nuclear safety and security.[48] Consequently, their impacts on the risk of nuclear terrorism or nuclear power disaster cannot be neglected. The following must be borne in mind once again: the fact that a serious nuclear terrorist incident has not occurred yet does not give room for optimism into the future.

Nuclear Proliferation in East Asia

North Korea and Myanmar, the countries discussed in this section, have a history of fueling international concerns over the proliferation of their nuclear, chemical, and biological weapons. North Korea has ratified the BWC but unilaterally declared withdrawal from the NPT in 2003. North Korea is also not party to or a member of the CTBT, the Missile Technology Control Regime (MTCR), and the CWC.[49] Myanmar is party to the NPT, has signed the Additional Protocol to the IAEA safeguards agreement in 2013, and has signed the Southeast Asia Nuclear Weapon-Free Zone Treaty in 1995. Myanmar has not, however, ratified the CWC, the BWC, and the CTBT.[50] Due to space constraints, this paper examines below proliferation issues in North Korea and Myanmar, in particular, mainly focusing on nuclear proliferation concerns.

North Korea

The WMD proliferation problem in North Korea has become more acute in recent years. North Korea conducted nuclear tests in 2006, 2009, and 2012. It has also repeatedly test-fired ballistic missiles. In 2008, the disablement of North Korea's nuclear reactor in accordance with the denuclearization agreement of the Six-Party Talks was brought to a halt, even as North Korea completed eight of the eleven steps of the process. Subsequently, in 2009, North Korea declared the resumption of nuclear weapons production.[51] Furthermore, the revelation of North Korea's long suspected uranium enrichment activities for the first time ever in 2010 exposed the international community's imperfect grasp of the North Korean nuclear development program. At the same time, the possible proliferation of North Korea's nuclear and ballistic missile technology to other countries, such as Libya, Syria, Pakistan, and Iran, is another serious cause for concern. In 2009, an arms smuggling vessel (ANL Australia) headed to Iran from North Korea was seized in the United Arab Emirates. Additionally, a vessel smuggling conventional weapons from North Korea

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47 Yoshio Katayama, "Terorizumu no Honshitsu [The Essence of Terrorism]," Tero Taisaku wo Kangaeru Kai and Naofumi Miyasaka, eds., *Tero Taisaku Nyumon: Henzaisuru Kiki eno Taishoho* [An Introduction to Counterterrorism Measures: Approaches for Tackling Maldistributed Risks], Akishobo, 2006, p. 19.

48 Sukeyuki Ichimasa, "Discussions regarding Nuclear Safety and its Outlook for the Future," *Briefing Memo*, May 2012 <http://www.nids.go.jp/english/publication/briefing/pdf/2012/briefing_e165.pdf>.

49 "Country Profile: North Korea," Nuclear Threat Initiative, July 2014.

50 "Country Profile: Myanmar," Nuclear Threat Initiative, March 2014.

51 Larry A. Niksch, "North Korea's Nuclear Weapons Development and Diplomacy," *CRS Report for Congress*, January 5, 2010, p. 16.

to Congo was seized in South Africa. It was confirmed in May 2011 that a smuggling vessel (M/V Light) with missile-related parts sailing the South China Sea bound for Myanmar turned around to North Korea, circumventing the monitoring of neighboring countries.[52] In another example, a Chinese company exported to North Korea large special vehicles to be used for transporting and launching ballistic missiles.[53] As seen from this example, China is suspected of going a step further from serving as a point of transfer for WMD proliferation, as symbolized by China's toleration of cargo transshipment at Dalian port,[54] to directly or indirectly helping North Korea proliferate WMD and related materials. According to the 2012 Report of the Panel of Experts established pursuant to Resolution 1874 regarding sanctions against North Korea (S/2012/422), North Korea's WMD proliferation problem concerns mainly nuclear weapons programs and ballistic missiles; no new information related to the proliferation of biological and chemical weapons has been obtained.[55]

As was noted at the beginning of this section, North Korea is not a member of most multilateral frameworks for the non-proliferation of WMD. Not once has North Korea submitted a national report pursuant to Security Council Resolution 1540 that obliges all UN States Parties to refrain from proliferating WMD to non-state actors.[56] It is believed that North Korea, which vows to the outside world that "nuclear deterrence is a powerful weapon for national defense,"[57] has not changed its stance towards denuclearization even after authority was passed down from Kim Jong-il to Kim Jong-un.

The 5 MWe graphite moderated reactor in Yongbyon that began operating in 1987 is capable of extracting 6 kg of plutonium per year. This is equivalent to the significant quantity needed to develop roughly a single nuclear weapon. In May 1994, North Korea stopped the reactor and removed 8,000 fuel rods (capable of extracting 25-30 kg [equivalent to four to six nuclear weapons] of plutonium through reprocessing). The reactor was restarted in February 2003. When it was stopped in April 2005, North Korea is deemed to have removed 8,000 additional fuel rods. The reactor was re-stopped in July 2007, and at that time, the IAEA installed surveillance equipment to monitor the reactor remotely. Subsequently, in June 2008, the cooling tower at Yongbyon was destroyed based on an agreement. Since then, the reactor has not been in operation. In November 2009, the North Korean media reported that the reprocessing of 8,000 spent fuel rods would be completed by August 2010.[58]

At the Six-Party Talks in 2008, North Korea declared it had 37 kg of plutonium in its possession. Nevertheless, there are numerous speculations as to how much plutonium North Korea possesses today, as IAEA's safeguard measures have been interrupted repeatedly and no accurate evidence has been able to be obtained through verification. For example, though the report is slightly dated, in an assessment in 2006, Siegfried Hecker estimated that North Korea has already produced between 40 kg to 50 kg of plutonium and analyzed that it used 6 kg of this plutonium

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52 Shirley A. Kan, "China and Proliferation of Weapons of Mass Destruction and Missiles: Policy Issues," *CRS Report for Congress*, November 7, 2012, p. 31.

53 *Asahi Shimbun*, June 13, 2012.

54 *Sankei Shimbun*, June 14, 2012.

55 United Nations Security Council, S/2012/422.

56 UN 1540 Committee, National Reports <http://www.un.org/en/sc/1540/national-implementation/national-reports.shtml>.

57 *Reuters*, October 1, 2012.

58 *Korea Joongang Daily* (Japanese edition), November 4, 2009.

for the first nuclear test.[59] In a 2012 Congressional Research Service (CRS) Report for Congress, it is noted that North Korea separated and produced plutonium ranging between 30 kg and 50 kg and used 5 kg to 6 kg of this plutonium to create a nuclear device for the nuclear tests in 2006 and 2009, respectively.[60] Selig Harrison, who visited North Korea in 2010, commented that North Korea has already weaponized 30.8 kg of plutonium, according to inside information from a North Korean senior government official.[61] David Albright and Christina Walrond reputed for their image analyses using commercial satellite images state that North Korea could have produced 34 kg to 36 kg of plutonium as of 2012, enough to possess 6 to 18 nuclear weapons in light of North Korea's weaponization capabilities.[62]

Furthermore, according to Hecker, during his visit to North Korea in 2010, he was taken to a uranium enrichment facility in Yongbyon with over 2,000 centrifuges believed to be the P-2 model. North Korea explained that the facility has separative work capacity of 8,000 kg/year and that it would be used to fuel 25 to 30 MW light-water reactors to be constructed in the future.[63] How did North Korea acquire uranium enrichment technologies? From where did North Korea procure parts and equipment used for as many as 2,000 centrifuges? The fact that the international community had been mostly unaware of this lies the problem. In this regard, Albright and Paul Brannan point to the relationship with the A.Q. Khan network and the possibility that North Korea procured parts and equipment from all over the world using China as a transshipment port.[64] The area around Yongbyon was known to have an uranium enrichment facility. As such, it was one of the key areas which had been subject to international stationary monitoring for many years, with satellite images taken frequently from space. That makes it all the more difficult to grasp the full picture of HEU in North Korea's possession, had uranium enrichment activities been undertaken secretly in another area of North Korea.

As symbolized by its ballistic missile test-firings in 2012, North Korea is also believed to be directing efforts into developing means of delivery. In January 2011, former U.S. Secretary of Defense Robert Gates suggested that North Korea was within five years of developing an intercontinental ballistic missile (ICBM) and that North Korea's ICBM would become a direct threat to the United States.[65]

According to Hans M. Kristensen, North Korea's nuclear strategy is still in an early stage and the development of a deliverable nuclear weapons capability can be considered modernizations.

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59 Siegfried S. Hecker, "Report on North Korean Nuclear Program," Center for International Security and Cooperation, Stanford University, November 15, 2006 <http://www.ncnk.org/resources/publications/Hecker Report%20on%2011%2006%20PY%20trip.pdf>.

60 Mary Beth Nikitin, "North Korea's Nuclear Weapons: Technical Issues," *CRS Report for Congress*, February 29, 2012, p. 5.

61 *The Korea Herald*, March 30, 2010.

62 David Albright and Christina Walrond, "North Korea's Estimated Stocks of Plutonium and Weapon Grade Uranium," Institute for Science and International Security, August 16, 2012, p. 10 <http://isis-online.org/uploads/isis-reports/documents/dprk_fissile_material_production_16Aug2012.pdf>.

63 Siegfried S. Hecker, "A Return Trip to North Korea's Yongbyon Nuclear Complex," Center for International Security and Cooperation, Stanford University, November 20, 2010 <http://iis-db.stanford.edu/pubs/23035/HeckerYongbyon.pdf>.

64 David Albright and Paul Brannan, "Taking Stock: North Korea's Uranium Enrichment Program," The Institute for Science and International Security, October 8, 2010. <http://isis-online.org/uploads/isis-reports/documents/ISIS_DPRK_UEP.pdf>.

65 *The New York Times*, January 11, 2011.

The Scud C and Nodong short-range missiles, the Musudan medium-range missile, and the Hwasong-13 (or KN-08) and Taepo Dong long-range missiles are deemed to have nuclear warhead delivery capabilities. However, as of the writing of this paper, the Hwasong-13 and the Musudan medium-range missile have yet to be test-flown. The Taepo Dong long-range missile has been successfully test-flown only as a space launch vehicle. Throughout the past three nuclear tests, there are no official media reports that North Korea conducted tests of a re-entry vehicle for the transport of nuclear warheads. Also, although other nuclear-weapon states developed nuclear bombs dropped from aircraft as their first delivery system, there have been no North Korean media reports on any aircraft operations.[66] The Taepo Dong long-range missile test, in particular, seemed to be aimed at checking space launch capabilities. Furthermore, North Korea is still considered to have very few nuclear weapons in its possession. On such basis, it is debated that North Korea is developing nuclear weapons capability with a view to using it for High-Altitude Electromagnetic Pulse (HEMP) attacks.[67]

On May 20, 2014, "38 North" at Johns Hopkins University hypothesized based on analyses of commercial satellite images that North Korea is constructing a new complex at the Sohae Satellite Launching Station and that North Korea is conducting KN-08 mobile missile engine tests at the Station.[68]

Myanmar

Myanmar established an atomic energy division at the Union of Burma Applied Research Institute in 1956. Since joining the IAEA in 1957, Myanmar continued to carry out nuclear power-related research over nearly four decades, receiving technical assistance from various countries. However, the level of research and budget were extremely small. An IAEA-supplied neutron generator was set up at Rangoon University's physics department. Until 2009, Myanmar is deemed to have conducted basic research with the IAEA in medicine, agriculture, and radiation safety. In 2001, although Myanmar requested the IAEA's provision of a research reactor, the IAEA allegedly rejected the request on the grounds that Myanmar lacked the technological and educational base to operate the research reactor.[69]

As such, Myanmar's nuclear development program does not seem to be of concern at first glance. The following are given as reasons for why the program began to draw attention: (1) The 2002 conclusion of an agreement to purchase a research reactor from Russia; and (2) The rapid deepening of Myanmar-North Korea cooperative relations, especially increases in mutual visits by the two countries' military personnel and senior government officials by aircraft and vessel.[70] With regard to (1), the agreement to provide a research reactor reached between Russia and Myanmar in 2002 was shelved once in 2003 due to financial difficulties on the Myanmarese side. Nevertheless, in 2007, the two countries concluded an agreement once again. On this occasion,

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66 Hans M. Kristensen, "Nuclear Weapons Modernization: A Threat to the NPT?" *Arms Control Today*, May 2014, p. 15.

67 *The Washington Times*, December 19, 2012.

68 38 North, "Update on North Korea's Sohae Satellite Launching Station: Rapid Construction of Possible New Launch Complex," May 20, 2014 <http://38north.org/2014/05/sohae052014/>.

69 IISS Strategic Dossier, *Preventing Nuclear Dangers in Southeast Asia and Australasia*, IISS, 2009, pp. 101-118.

70 Ibid., pp. 108-112.

it was agreed that in addition to the provision of the research reactor, roughly 1,000 Myanmarese engineers per year would receive education and training in Russia. The research reactor that Russia is expected to provide is a 10 MWt light-water reactor fuelled with 20% HEU and was expected to be placed under the IAEA's safeguard measure.[71]

With respect to (2), the diplomatic relations between North Korea and Myanmar were once severed following the Rangoon incident in 1983 but were later resumed. In the 1990s, North Korea began to sell small-arms ammunitions, canons, among other arsenals, to Myanmar. In November 2008, Myanmar's senior military official visited North Korea, and the two countries signed a memorandum on military cooperation. Against this backdrop, in recent years, numerous suspicions have been raised over the transport of military-related goods using sea and air routes between Myanmar and North Korea.[72]

In August 2009, two Myanmarese in exile agreed to an interview with Prof. Desmond Ball of the Australian National University and others. During the interview, the two testified that Myanmar is secretly developing nuclear weapons with the support of North Korea and Russia. According to media reports, North Korea's technical assistance to Myanmar dates back to 2000. In addition to the construction of uranium refining facilities in Myanmar, the country has exported yellowcake (UF6) to North Korea and Iran. Furthermore, Russia is supporting Myanmar's construction of a second nuclear reactor (to be operated in or after 2014) that has not been declared to the IAEA. Russia is also technically engaged in the construction of the reprocessing plant for plutonium extraction.[73]

Despite this, no definitive evidence has come to light regarding Myanmar's nuclear development suspicions.[74] In recent years, along with the country's democratization process, senior government officials of Myanmar have spoken about its past nuclear-related activities. In June 2011, Thiha Thura U Tin Aung Myint Oo, Vice President of Myanmar, allegedly told a visiting U.S. delegation headed by Senator John McCain: "Myanmar has halted its nuclear research as the international community misunderstands Myanmar's activities." Moreover, in June 2012, at the Asia Security Summit (Shangri-La Dialogue) held by the UK think tank, the International Institute for Strategic Studies (IISS), in Singapore, Hla Min, Minister of Defense of Myanmar, admitted that the country abandoned its nuclear development program in the past but explained that the program was for peaceful purposes. At the same time, Minister of Defense Hla Min stated that Myanmar's military relationship with North Korea was contracting and that Myanmar will be ensuring greater transparency of its various bilateral relationships. Meanwhile, with regard to the possibility that the IAEA is allowed to verify past undeclared activity, Minister of Defense Hla Min maintained that there was nothing to investigate.[75]

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71 Ibid., p. 103.

72 Aung Zaw, "Burma's Secret Mission to North Korea," *The Irrawaddy*, Vol. 17, No. 4, July 2009, p. 26; *Asia Times*, July 19, 2006; Andrew Selth, "Burma and Nuclear Proliferation: Policies and Perceptions," *Griffith Asia Institute Regional Outlook Paper*, No.12, 2007, p. 12; *The Washington Post*, July 22, 2009.

73 *The Sydney Morning Herald*, August 1, 2009.

74 IISS Strategic Dossier, *Preventing Nuclear Dangers in Southeast Asia and Australasia*, p. 108.

75 "Myanmar's Reforms: the Nuclear Dimension," *IISS Strategic Comments*, Vol. 18, Comment 42, November 2012; Ernest Bower, Michael Green, Christopher Johnson and Murray Hiebert, "CSIS Myanmar Trip Report: State of the Nation and Recommendation for U.S. Policy," CSIS, September 10, 2012, pp. 5-6; "Report of the Panel of Experts Established Pursuant to Resolution 1874," p. 29.

WMD Non-Proliferation Policies and Trends in CBRN Defense of Key East Asian States

This section examines the general WMD non-proliferation policies and CBRN defense activities of the ROK and China, key states in the East Asian region. It can be assessed that currently, both countries engage proactively in multilateral treaties for WMD disarmament and non-proliferation, notably, the NPT, the CWC, and the BWC, while the countries have different stances towards the arrangements such as the CTBT, negotiation for the FMCT, and the PSI. The two countries adopt their own unique approaches to CBRN defense, possibly owing to differences in their security environment or level of interest. The ROK and China alike give priority to CBRN defense capacity-building, and both are exploring close coordination with related sectors, including relevant ministries and agencies and local governments.

The Republic of Korea

According to information released by the government of the ROK, its WMD non-proliferation policies consist of four main pillars: (1) disarmament and non-proliferation activities related to WMD; (2) cooperative activities for strengthening the international non-proliferation regime; (3) activities in the field of conventional weapons; and (4) disarmament and non-proliferation within the UN framework.[76] (1) is represented by the ROK's hosting of the second Nuclear Security Summit in 2012, contribution as Vice-President of the 2010 NPT Review Conference, etc., and strong response to the nuclear and missile issues of North Korea and Iran. In particular, in response to North Korea's activities, the ROK contributed to the adoption of the Statement by the President of the Security Council following North Korea's rocket launch in April 2009 and the adoption of Security Council Resolution 1874 by the P5 + 2 (Japan and the ROK) following North Korea's nuclear test in May 2009. In response to the Iranian nuclear issue, the ROK called for measures to effectively implement Security Council Resolution 1929, namely, the inspection of suspicious cargo and the widening of the scope of financial sanctions. As for (2), examples include the ROK joining PSI's Operation Experts Group (OEG) in November 2010 and the hosting of the 2011 7th Plenary Meeting of the Global Initiative to Combat Nuclear Terrorism (GICNT). With respect to (3), the ROK maintains the position that instead of joining the Convention on Anti-Personnel Mines and the Convention on Cluster Munitions due to the unique circumstances of the Korean Peninsula, the ROK participates actively in the consultations related to the Convention on Certain Conventional Weapons (CCW). In the area of (4), the ROK has proposed a resolution entitled, "Preventing and Combating Illicit Brokering Activities," which was adopted at the 65th UN General Assembly First Committee in 2010. The ROK also co-hosts a conference on disarmament and non-proliferation every year with the UN.

The ROK military's CBRN response is said to be principally aimed at the nuclear and chemical weapons in North Korea's possession. Nonetheless, information about North Korean WMD capabilities is hardly known, except for nuclear weapons-related intelligence.[77]

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[76] Ministry of Foreign Affairs and Trade, Republic of Korea, "ROK's Disarmament and Non-Proliferation Activities" <http://www.mofat.go.kr/ENG/policy/disarmament/overview/disarmament/index.jsp?menu=m_20_70_10>.

[77] IISS Strategic Dossier, *North Korea's Chemical and Biological Weapons Programmes*, IISS, 2004 <http://www.iiss.org/publications/strategic-dossiers/north-korean-dossier/north-koreas-weapons-programmes-a-net-asses/north-koreas-chemical-and-weapons-cbw-prog/>.

In this context, U.S.-ROK partnerships constitute an important element of the CBRN response. In particular, the U.S.-ROK cooperation on CBRN response through joint military exercises and other activities until the transfer of wartime operational control (OPCON), mainly military capabilities to quickly secure North Korea's WMD in the situation of contingencies on the Korean Peninsula, is unique to the ROK.

In recent years, the ROK forces and the U.S. forces in the ROK have conducted the "Foal Eagle" and "Key Resolve" exercises, whose objectives are deemed to include the elimination of nuclear weapons and their means of delivery in Korean Peninsula contingencies. However, such joint military exercises based on WMD scenarios in fact have histories which are by no means long.

In 2005, the Combined Forces Command (CFC) recognized the urgent need for and began to review the establishment and training of a WMD elimination task force. Subsequently, the 2007 U.S.-ROK "Ulchi Focus Lens" combined exercise led to the outcome and lesson learned that CFC lacked appropriate ground components that can deal with the CBRN threat, had inadequate equipment and training, and needed to have a quorum of specialized teams that can cover the large number of WMD-related facilities in North Korea. At this time, the ROK NBC Command (National Military Chemical Biological and Radiological Defence Command), which was established in 2002 subordinate to the ROK Defense Minister, played a central role in the ROK's CBRN response within CFC.[78] A reconnaissance battalion, a decontamination battalion, and the Chemical Defense Research Institute make up the NBC Command to deal with biological, chemical, and radiological situations. It is believed that the NBC Command also engages in research activities focusing on analyses of chemical agents.[79] Furthermore, the NBC Command has ties to other entities, including government organizations such as the Korea Institute of Nuclear Safety (KINS). Nowadays, the NBC Command's mandate is to counter not only North Korea's WMD threats but also diverse CBRN situations, such as nuclear plant accidents and nuclear terrorism. Aside from CFC, several chemical units exist within the ROK military and receive direct support from CFC.[80]

Since 2011, the ROK has held the "Able Response" joint exercise with the U.S. Department of Defense and Department of Health and Human Services. The exercise is part of a broader CBRN cooperation not limited to the category of unit-to-unit cooperation and takes into account the risk of biothreat posed by North Korea (viral and bacterial attacks). The exercise is a series of CBRN tabletop exercises based on scenarios that presume cooperation between ministries and agencies.[81] The exercise aspires not only to strengthen the U.S.-ROK alliance, but also to achieve a whole-of-government approach to responding to various biothreats, regardless of whether they are terrorist attacks or natural outbreaks of disease or disaster, by increasing civil-military cooperation in the ROK and integrating the efforts of public health systems, first responders, and military capabilities. The exercise is said to have yielded a number of outcomes and lessons learned in

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78 Daniel Pinkston, "US-ROK Military Exercises," International Crisis Group, March 7, 2011 <http://www.crisisgroup.org/en/regions/asia/north-east-asia/north-korea/op-eds/us-rok-military-exercises.aspx>.

79 "South Korea Military," ROK Military Website.

80 "Weapons of Mass Destruction (WMD)," GlobalSecurity.org <http://www.globalsecurity.org/wmd/library/policy/army/fm/3-100/Ch13.htm>.

81 Seong Sun Kim, Dong Whan Oh, Hyun Jung Jo, and Chaeshin Chu, "Introduction of the Republic of Korea–the United States of America's Joint Exercise Against Biothreats in 2013: Able Response 13," *Osong Public Health Res Perspect*, October 2013, No. 4, Vo. 5, pp. 285–290.

bio-surveillance, diagnostics, forensics, information sharing, civil and military operations, and policies.[82]

China

In "China's National Defense in 2010," China declared that it: takes an active part in international efforts in the field of arms control, disarmament, and non-proliferation; respects and accommodates the legitimate and reasonable security concerns of all countries; maintains global strategic balance and stability; and firmly opposes the proliferation of WMD and their means of delivery.[83]

Notwithstanding China's present approach, it should be kept in mind that China's policy had twists and turns, beginning with its boycott of the NPT from 1964 to the late 1970s, partial participation in the WMD non-proliferation regime from the late 1970s to the end of the Cold War, and the current full-fledged participation in the WMD non-proliferation regime since joining the NPT in 1992.[84] As of 2012, China has received inspections of the CWC more than 240 times. Furthermore, China has been proactive about developing domestic legislation and establishing a liaison office for the execution of the BWC. On the other hand, China has not ratified the CTBT. China has a history also of interfering with the commencement of the FMCT negotiations until the mid-2000s, contending that a linkage was needed with the Prevention of an Arms Race in Outer Space (PAROS).

Regarding suspicions about North Korean and Iranian nuclear development, China in principle has worked to resolve the issue through dialogue and consultation and opposed economic sanctions. In addition, with respect to China's relationship with WMD non-proliferation regimes, China has sought membership in the MTCR in recent years. In connection with such export control regimes, the United States, in accordance with domestic legislation, has imposed economic sanctions on Chinese government organizations, companies, and individuals over the transfer of dual-use products unregulated by the MTCR. However, with many of the United States' economic sanctions invoked since 2003 shifting to Iran, some analysts observe that China has been demonstrating a proactive approach to improving its relations with the United States through the fields of WMD non-proliferation and export control.[85]

Conversely, China has always refrained from participation in PSI on the grounds that it interferes with China's free economic development, among other reasons. Some observers point out that China is possibly concerned that participation in PSI would ignite a backlash from North Korea. It is also suggested that China, which continues to serve as a relay point for North Korea's WMD proliferation despite being a permanent member of the Security Council, is making political

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82 Richard Kiehart, "Able Bodied," *CBRNe WORLD*, February 2012, pp. 47-48.

83 "China's National Defense in 2010," Information Office, State Council, People's Republic of China, March 2011.

84 Zhu Liqun, ed., *International Non-proliferation System: China and the U.S.*, World Affairs Press, 2011, p. 188.

85 Junichi Abe, "Chugoku no Kaku Misairu Kaihatsu to Kokusaiteki Kakusan Boshi Rejiimu no Taio [China's Nuclear Missile Development and Its Approach to International Non-proliferation Regimes]," *Asian Studies*, Vol. 53, No. 3, 2007, p. 21.

accommodations of some form to North Korea.[86]

One of China's basic national laws pertaining to CBRN response is the Emergency Response Law of the People's Republic of China of 2007.[87] This law is not necessarily specific to CBRN response. It is considered a basic law on crisis management policy for responding to incidents, such as natural disaster, social turmoil, public health incident, and terrorist attack.[88] Few laws provide for the relationship between the People's Liberation Army (PLA) and the government departments centered around the State Council vis-à-vis policies for the management of crises, including CBRN scenarios.[89] Accordingly, researchers of the PLA are exploring the mobilization of PLA personnel to CBRN situations by relying on the Emergency Response Law.[90] The Regulations on Emergency Measures for Nuclear Accidents at Nuclear Power Plants of 1993 is a national regulation which presumes a large-scale accident at a nuclear power plant. In these regulations, too, the PLA is specified as a vital force for accident response.[91]

Meanwhile, PLA regulations on CBRN responses have also been established. For instance, in 1997, the State Council and the Central Military Commission promulgated the Regulations on the People's Liberation Army's Participation in Emergency Rescue Operations in Response to Nuclear Accidents at Nuclear Power Plants, in order to adapt to the Regulations on Emergency Measures for Nuclear Accidents at Nuclear Power Plants.[92] Additionally, Article 47 of the Regulations on the People's Liberation Army Headquarters Works,[93] which entered into force in 2006, provides that PLA units shall participate in various crisis management operations.[94]

As can be seen from the above, CBRN-related legislation development has made progress in China, both at the national level and at the level of PLA regulations. Nonetheless, it remains difficult to grasp an overall picture, especially of PLA regulations. Only fragmentary information has been obtained through available materials, media reports, and other sources.

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86 Nobumasa Akiyama, "PSI to Kaiyo Anzenhosho: Yuruyaka na Gabananansu no naka no Enfoosumento [PSI and Maritime Security: Enforcement under Moderate Governance]," *Mamoru Umi, Tsunagu Umi, Megumu Umi: Kaiyo Anzenhosho no Shokadai to Nihon no Taio* [Sea that Protects, Sea that Connects, and Sea that Gives Alms: Maritime Security Challenges and Japan's Response], The Japan Institute of International Affairs, 2012, pp. 59-60.

87 *People's Daily*, November 1, 2007.

88 *People's Daily*, October 31, 2007.

89 Aside from the Emergency Response Law of the People's Republic of China, the National Defense Mobilization Law of the People's Republic of China (promulgated in February 2010) is a representative law that provides for the relationship between PLA units and government divisions vis-à-vis crisis management policies. For more information regarding the law's enactment process and its content, see: Emi Miyao, "*Chugoku Kokubo Doinho no Seitei* [The Enactment of China' National Defense Mobilization Law]," *Gaikoku no Ritpo* [Lawmaking in Other Countries], December 2010, pp. 102-124; The National Institute for Defense Studies, *East Asian Strategic Review 2011*, The National Institute for Defense Studies, 2011, pp. 132-134.

90 Ni Baiming, Zhou Chengxi, and Wang Mingwei, *Study on Military Command of Responses to Unexpected Nuclear, Biological and Chemical Accidents*, National Defense University Press, 2009, p. 14. The authors are researchers affiliated with the PLA National Defense University and other institutions.

91 Regulations on Emergency Measures for Nuclear Accidents at Nuclear Power Plants <http://www.gov.cn/ziliao/flfg/2005-08/06/content_20995.htm>.

92 Chen Ting, "Study of Laws and Regulations Relating to the Military's Non-Traditional Security Responses," *Military History Research*, No. 1, 2009, pp. 130-136. The author is a researcher at the Department of World Military Research, Academy of Military Science, PLA, China.

93 *PLA Daily*, March 20, 2006.

94 Ni Baiming, Zhou Chengxi, and Wang Mingwei, *Study on Military Command of Responses to Unexpected Nuclear, Biological and Chemical Accidents*, p. 15.

With regard to cooperation between the PLA and government departments, progress has been seen in the areas of counterterrorism measures and emergency responses to large-scale nuclear power plant accidents. In 2001, China set up the National Anti-Terrorism Coordination Group. Furthermore, the National Nuclear Emergency Plan, which was promulgated in 2006, specifies the establishment of the National Nuclear Emergency Coordination Committee to serve as an emergency organ for responding to large-scale nuclear plant accidents.[95] Compared to the responses for large-scale nuclear plant accidents, however, the arrangements are unclear regarding responses to other contingencies, such as chemical accidents. Some analysts note that the emergency response is not a unified, systematic system.[96] In addition, in the public health field, while there is a crisis management system for government departments centered around the State Council, it is unclear where PLA units fit into the system.[97] Nevertheless, the State Council may request the mobilization of PLA units to respond to these events, pursuant to the provisions of Article 14 of the Emergency Response Law of the People's Republic of China.[98]

As to responses at the field level, the PLA permits the local Communist Party committee and the local government to advise the units of the unified command.[99] However, while the PLA in principle accepts the instructions of the local Communist Party committee and the local government, priority is placed on ensuring the independence of unit operations. This problem is attributed to China's unique political structure in which coordination between the PLA and government departments presumes receiving direction from the Central Committee of the Communist Party of China, the Central Military Commission, and the heads of these organs.[100]

With the promulgation of a new Outline of Military Training and Evaluation in 2008,[101] the PLA has been putting efforts into CBRN defense exercises in recent years. For example, in 2008, the year that the Outline was promulgated, the PLA for the first time conducted a joint anti-chemical group training, with the participation of units from the Army, Navy, Air force, and the Second Artillery.[102] In 2010, the PLA conducted a cross-military CBRN defense training reform study named "Protect 2010" at the Beijing Military Area Command.[103] In 2011, the first joint sea exercise among CBRN emergency rescue units was carried out, with trainings focusing on five areas, such as conducting emergency measurements of nuclear radiation levels, emergency measures in response to leaks of toxic and hazardous gases, and decontamination, according to the PLA Daily.[104] Furthermore, it is said that the PLA is studying the possibility of making proactive

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95 National Nuclear Emergency Plan <http://www.law-lib.com/law/law_view.asp?id=132796>.

96 Ni Baiming, Zhou Chengxi, and Wang Mingwei, *Study on Military Command of Responses to Unexpected Nuclear, Biological and Chemical Accidents*, p. 105.

97 Ibid., pp. 108-114.

98 Emergency Response Law of the People's Republic of China.

99 Ni Baiming, Zhou Chengxi, and Wang Mingwei, *Study on Military Command of Responses to Unexpected Nuclear, Biological and Chemical Accidents*, pp. 108-114.

100 Regarding the relationship between the party, the PLA, and the government in contemporary China, see The National Institute for Defense Studies, ed., *NIDS China Security Report 2012*, The National Institute for Defense Studies, December 2012.

101 *PLA Daily*, July 27, 2008 and July 30, 2008.

102 *PLA Daily*, December 22, 2008.

103 *PLA Daily*, September 19, 2010.

104 *PLA Daily*, May 27, 2011.

uses of reserve units for CBRN responses.[105] And the media has reported that reserve unit trainings in CBRN responses were conducted.[106]

Conclusion

As this paper has reiterated, WMD non-proliferation and CBRN defense are similar at first glance but are actually quite different. Nevertheless, especially from the standpoint of CBRN defense, WMD non-proliferation has a role that is by no means small in reducing the sources of CBRN threats. The series of WMD non-proliferation approaches alone will not avoid the risk of the utilization of NBC weapons, or the risk of non-weaponized CBRN assets becoming means or targets of terrorist attacks. It nonetheless remains critical that multi-layered WMD non-proliferation efforts are sustained over a long term through multilateral coordination.

The spectrum of CBRN defense is extremely broad. In addition, the nature of CBRN threats and the scale of the presumed damages are wide-ranging. The causes of CBRN situations are also broad in scope, ranging from armed conflict among states, terrorist attack and natural disaster, to accident. Each of the above-mentioned scenarios represents a momentous challenge to the government and all other domesctic sectors. The development of effective mechanisms against such CBRN threats is a priority not only in the case of the ROK and China that were discussed in this paper, but also across the globe.

[105] Liu Baojian, "Three Issues to Note and be Aware of during Emergency Mobilizations for Nuclear, Biological, and Chemical Rescue Operations," *National Defense*, No. 11, 2006, p. 22. The author is a commander at the Neijiang Military Sub-Command.

[106] *China Defense News*, August 15, 2012; *China Military Online*, November 9, 2011.