"Hiroshima for Global Peace" Plan

2019 Edition

Hiroshima Report

Evaluation of Achievement in Nuclear Disarmament, Non-Proliferation and Nuclear Security in 2018

Hiroshima Prefecture

Center for the Promotion of Disarmament and Non-Proliferation
The Japan Institute of International Affairs

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ISBN978-4-9910140-7-9

Printed in Japan

Published by Hiroshima Prefecture

Edited by Center for the Promotion of Disarmament and Non-Proliferation (CPDNP),
The Japan Institute of International Affairs

We would appreciate any comments or suggestions that will help us to enhance the Hiroshima Report. Please send your comments and suggestions regarding this report to chiheiwa@pref.hiroshima.lg.jp or visit our online survey at: http://www.pref.hiroshima.lg.jp/site/peace-en/hiroshimareport2019e.html.

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Preface and Acknowledgements

This report, *Hiroshima Report 2019: Evaluation of Achievement in Nuclear Disarmament, Non-Proliferation and Nuclear Security in 2018* (hereinafter referred to as "*Hiroshima Report 2019*") is an outcome of the "Hiroshima Report Publication Project,"[1] commissioned by Hiroshima Prefecture to the Japan Institute of International Affairs (JIIA). It updates the previous reports issued since 2013. As in the last six years, the *Hiroshima Report* is published in both Japanese and English.

The prospects of eliminating nuclear weapons are still distant at best. Even more worrying, the situation regarding nuclear weapons is becoming more and more complex. The five nuclear-weapon states (NWS) under the Nuclear Non-Proliferation Treaty (NPT)—China, France, Russia, the United Kingdom and the United States—and other nuclear-armed states—India, Israel and Pakistan—continue to perceive their nuclear weapons as one of the indispensable components for their national security, and have not made any definite move toward renouncing their nuclear arsenals. Instead, they have taken measures, such as modernization of nuclear forces and development of new delivery vehicles, with a view to sustaining nuclear deterrence for a longer period. Furthermore, the United States announced to withdraw from the Intermediate-Range Nuclear Forces (INF) Treaty. Non-nuclear-weapon states (NNWS) increase their frustration over such a situation. Many of them pursue to promote a legal prohibition of nuclear weapons, and finally concluded the Treaty on the Prohibition of Nuclear Weapons (TPNW) on July 7, 2017. However, nuclear-armed states and allies refuse to sign the treaty. It is also a concern that the rift between proponents (many NNWS) and opponents (nuclear-armed states and allies) has been further widening.

The status and prospects regarding nuclear non-proliferation are also gloomy. Although convening the inter-Korean and the U.S.-North Korean summits brought about the increased expectation of North Korean denuclearization, it is unclear whether Pyongyang has made a strategic decision on renouncing its nuclear arsenals. As for the Iran nuclear issue, as was concerned, the United States announced withdrawal from the Joint Comprehensive Plan of Action (JCPOA). While the world falters in erecting

[1] This project has been conducted as a part of the "Hiroshima for Global Peace" Plan launched by Hiroshima Prefecture in 2011.

a firm barrier against nuclear proliferation, the threat persists for a new proliferator to emerge on the scene. The threat of nuclear terrorism by non-state actors remains a high security concern in this globalized world. Growing worldwide interest in peaceful use of nuclear energy increases the risk of nuclear proliferation as well as terrorism. While problems facing nuclear disarmament, non-proliferation and nuclear security intensify, efforts toward solving them have progressed at a snail's pace.

The *Hiroshima Report* attempts to help the movement toward the abolition of nuclear weapons, first, by clarifying the current status of the issues and efforts surrounding nuclear disarmament, non-proliferation and nuclear security. By doing so, it aims to encourage increased debate on these issues by policy-makers, experts in and outside governments, and civil society. Furthermore, by issuing the "Report" and the "Evaluation" from Hiroshima, where a nuclear weapon was once used, it aims to help focus attention and promote further actions in various fields toward the realization of a world without nuclear weapons.

The Research Committee was established to conduct this project, namely producing the "Report" and the "Evaluation." This Committee met once within the Japanese Fiscal Year 2018 to discuss the contents. The members of the Research Committee are as follows:

Chairperson

Sumio Tarui (Director, Center for the Promotion of Disarmament and Non-Proliferation (CPDNP), JIIA)

Research Members

Sukeyuki Ichimasa (Senior Research Fellow, National Institute for Defense Studies)

Akira Kawasaki (Executive Committee Member, Peace Boat)

Masahiro Kikuchi (Board Member, Nuclear Material Control Center)

Mitsuru Kurosawa (Professor, Osaka Jogakuin University)

Kazumi Mizumoto (Vice-President, Hiroshima Peace Institute, Hiroshima City University)

Hiroshi Tamai (Senior Expert, Integrated Support Center for Nuclear Nonproliferation and Nuclear Security, Japan Atomic Energy Agency)

Research Member and Project Coordinator

Hirofumi Tosaki (Senior Research Fellow, CPDNP, JIIA)

The Research Committee appreciates the comments and advices to the "Report" given by the following experts.

Ambassador Nobuyasu Abe (Senior Fellow, Harvard Kennedy School)
Mr. Mark Fitzpatrick (Former Executive Director of the Americas Office and head of the Non-Proliferation and Disarmament Programme, International Institute for Strategic Studies)
Professor John Simpson (Emeritus Professor of International Relations, University of Southampton)
Professor Tatsujiro Suzuki (Director, Research Center for Nuclear Weapons Abolition, Nagasaki University)

In this edition, experts posted articles on the TPNW and other nuclear disarmament and non-proliferation issues.[2]

Appreciation is also expressed to Mr. Gordon Wyn Jones (King's College London, Centre for Science and Security Studies) for editing the *Hiroshima Report* as well as valuable comments.

Views or opinions expressed in the "Report," "Evaluation" and "Articles" are those of the members of the Research Committee or respective authors, and do not necessarily represent the view of the Hiroshima Prefecture, the JIIA, or the organizations to which they belong. Not all of the members necessarily agree on all of the points discussed.

[2] Views or opinions expressed in the articles are those of the respective authors, and do not represent the view of the Hiroshima Prefecture, the JIIA, or the organizations to which they belong. The Research Committee appreciates Shun Muramatsu, and Takaaki Sato for translating those articles.

Towards the 2020 NPT Review Conference

Special Message by Ms. Izumi Nakamitsu

United Nations Under-Secretary-General and High Representative for Disarmament Affairs

It is a pleasure to provide this special message to the *Hiroshima Report*. This unique report acts as a watch dog, holding all States accountable for their commitments to achieve a world free of nuclear weapons.

The Treaty on the Non-Proliferation of Nuclear Weapons (NPT) is the centerpiece of global efforts towards this goal. By virtue of its verifiable non-proliferation obligations, legally-binding disarmament commitment and near-universal status it has become a load-bearing pillar of the international peace and security architecture.

As relationships between nuclear-armed States deteriorate, as dangerous rhetoric about the utility of nuclear weapons is used, as regional crises with proliferation dimensions and the emergence of new technologies increase nuclear risks, and as the web of instruments and agreements that prevented the Cold War from going hot is eroded, the NPT cannot afford to falter. In the current environment it must remain strong.

The Treaty's Review Conference in 2020, marking the fiftieth anniversary of its entry into force, provides both a symbolic and practical opportunity to reaffirm the NPT's centrality to our collective security and to strengthen it so that it remains fit for purpose to deal with the nuclear weapon-related challenges of the 21st Century.

The obstacles to securing a successful outcome in 2020 are well-known. They include divisions between nuclear-weapon States, diverging views on how to achieve and maintain a world without nuclear weapons, and progress on a Middle East Zone free of Nuclear Weapons and all other Weapons of Mass Destruction.

None of these is insurmountable but time is running short.

States parties must act now to stake the common ground that will yield success in 2020. They should consider new and innovative ways to achieve this desired outcome. One procedural innovation could be to include a high-level segment at the Review Conference that could result in a ministerial declaration recommitting all States parties to the NPT and the full implementation of their commitments across all three of the Treaty's pillars.

States parties could also affirm that a nuclear war cannot be won and must never be fought. Maintaining the seventy decades old norm of the non-use of nuclear weapons should be every States parties' highest priority.

Secretary-General Guterres has committed to facilitating the dialogue necessary to find a common path to the elimination of nuclear weapons. Between now and 2020, I strongly encourage States parties to take every opportunity to do so.

Introduction

(1)Overview

Uncertainty on the future of nuclear issues has been increasing furthermore. The number of countries which have already signed and ratified the Treaty on Prohibition of Nuclear Weapons (TPNW)—opened for signature on September 20, 2017—are raising steadily, and its entry into force in the near future is on the horizon. However, nuclear-armed states and their allies continue to clearly state that they do not sign the TPNW. While none of the nuclear-armed states, including the United States which released the Nuclear Posture Review (NPR) in February 2018, have made major changes in their declaratory policies on nuclear strategy, they are increasingly dependent on nuclear deterrents, and modernizing their respective nuclear forces amid raising tensions among the great powers, as well as geostrategic competitions. Furthermore, the future of U.S.-Russian bilateral nuclear arms control, continuing from the Cold War era, is in doubt since there is no progress on extending the deadline of the U.S.-Russian New Strategic Arms Reduction Treaty (New START); and, more seriously, the U.S. President Donald Trump declared his intention to withdraw from the Intermediate-Range Nuclear Forces Treaty (INF treaty) in October. No indication could be seen that the impasse over multilateral nuclear disarmament, including the Comprehensive Nuclear Test-Ban Treaty (CTBT) and the Fissile Material Cut-off Treaty (FMCT), are headed for resolution.

Regarding nuclear non-proliferation, North Korea's aggressive diplomatic offensive, and the convening of the inter-Korean and the U.S.-North Korean summits, brought about the increased expectation of North Korean denuclearization. In addition, North Korea neither conducted nuclear and missile tests nor threatened uses of nuclear weapons in 2018, which it did repeatedly in the previous year. However, Pyongyang has not yet agreed on concrete and substantive measures for denuclearization. Its numerous illicit activities, that skillfully avoided sanctions against North Korea under the UN Security Council resolutions, have also been reported. As for the Iran nuclear issue, as was concerned, the United States announced withdrawal from the Joint Comprehensive Plan of Action (JCPOA) in May, and reimposed unilateral sanctions against Iran. Despite strong pressure and domestic opposition, Iran continued to comply with JCPOA through 2018. At the same time, Tehran also suggested the possibility of withdrawal

from the consensus if the U.S. sanctions prevail over Iran's national interest.

As regards nuclear security, no large-scale international forum was held in 2018, and the degree of appeal by each country toward strengthening nuclear security tended to decrease from the previous year. On the other hand, the importance of continuing the discussion on nuclear security at the multilateral forum level, where high-level participants are gathered, was argued. There was also a discussion that the relationship between the three pillars of the NPT (nuclear non-proliferation, nuclear disarmament, nuclear peaceful use) and nuclear security should be reviewed. In addition, the utilization of The Amendment of the Convention on the Physical Protection of Nuclear Material (CPPNM Amendment) and its framework that came into effect in 2016, and the comprehensive evaluation of the nuclear security summit process that ended in 2016, were also subject to discussions on international efforts towards nuclear security. Highly Enriched Uranium (HEU) has been considered attractive to terrorists. Regions where such nuclear material no longer exists are steadily increasing, and the removal of high-level radiation sources is also proceeding. On the other hand, as a new concern over nuclear security, the threat of drone attacks, together with cyber security, gained the attention of stakeholders.

(2) Items

In the *Hiroshima Report 2019,* 65 items (32 for nuclear disarmament, 17 for nuclear non-proliferation and 16 for nuclear security) for study, analysis and evaluation of the selected countries' performance are identified and based mainly upon the following documents that reflected widely supported views on the issues of nuclear disarmament, non-proliferation and nuclear security:

- The Action Plan and recommendations pertaining to the implementation of the 1995 Middle East resolution contained in the Final Document adopted in the 2010 Nuclear Non-Proliferation Treaty (NPT) Review Conference;
- The final draft of a Final Document for the 2015 NPT Review Conference;
- Seventy-six recommendations contained in the 2009 International Commission on Nuclear Non-proliferation and Disarmament (ICNND) report titled *Eliminating Nuclear Threats: A Practical Agenda for Global Policymakers*;
- Proposals sponsored or co-sponsored by Japan at the Preparatory Committees for the 2015 NPT Review Conference; and
- "Resolution towards the Abolition of Nuclear Weapons" launched by the Mayors for Peace in 2011.

Items were also chosen with the aim of providing a certain degree of objective measurements for evaluation.

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(1) Status of Nuclear Forces (estimates)

(2) Commitment to Achieving a World without Nuclear Weapons

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B) Announcement of significant policies and important activities

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A) Reduction of nuclear weapons

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C) Cooperation with the CTBTO Preparatory Commission

D) Contribution to the development of the CTBT verification systems

E) Nuclear testing

(8) FMCT

A) Commitment, efforts, and proposals toward immediate commencement of negotiations on an FMCT

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B) Signing and ratifying an Additional Protocol
C) Implementation of the integrated safeguards
D) Compliance with IAEA Safeguards Agreement

(3) IAEA Safeguards Applied to NWS and Non-Parties to the NPT

A) Application of the IAEA safeguards (Voluntary Offer Agreement or INFCIRC/66) to their peaceful nuclear in facilities
B) Signing, ratifying, and implementing the Additional Protocol

(4) Cooperation with the IAEA

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A) Establishment and implementation of the national control systems
B) Requiring the conclusion of the Additional Protocol for nuclear export
C) Implementation of the UNSCRs concerning North Korean and Iranian nuclear issues
D) Participation in the PSI
E) Civil nuclear cooperation with non-parties to the NPT

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A) Reporting on the peaceful nuclear activities
B) Reporting on plutonium management

3. Nuclear Security

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A) Convention on the Physical Protection of Nuclear Material and the 2005 Amendment to the Convention
B) International Convention for the Suppression of Acts of Nuclear Terrorism
C) Convention on Nuclear Safety
D) Convention on Early Notification of a Nuclear Accident
E) Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management
F) Convention on Assistance in Case of a Nuclear Accident or Radiological Emergency
G) INFCIRC/225/Rev.5
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B) Prevention of illicit trafficking
C) Acceptance of international nuclear security review missions
D) Technology development —nuclear forensics
E) Capacity building and support activities

F) IAEA Nuclear Security Plan and Nuclear Security Fund
G) Participation in international efforts

(3) Countries Surveyed in This Project

In the *Hiroshima Report 2018*, the performances of 36 countries were surveyed, based on their nuclear significance and geographical distribution—including members of the Non-Proliferation and Disarmament Initiative (NPDI), members of the New Agenda Coalition (NAC), participants of the Joint Statements on the Humanitarian Consequences of Nuclear Weapons. The *Hiroshima Report 2019* maintains to survey those same countries, as follows:

- Five nuclear-weapon states under the NPT (China, France, Russia, the United Kingdom and the United States);
- Non-state parties to the NPT (India, Israel and Pakistan);
- Non-nuclear-weapon states under the NPT (Australia, Austria, Belgium, Brazil, Canada, Chile, Egypt, Germany, Indonesia, Iran, Japan, Kazakhstan, South Korea, Mexico, the Netherlands, New Zealand, Nigeria, Norway, the Philippines, Poland, Saudi Arabia, South Africa, Sweden, Switzerland, Syria, Turkey and UAE); and
- Other (North Korea[1])

(4) Approach

This project focuses on the time period of calendar year 2018. Reference documents are basically from open sources, such as speeches, remarks, votes and working papers delivered at disarmament fora (e.g., NPT Review Conference, UN General Assembly, International Atomic Energy Agency (IAEA) General Conference, Conference on Disarmament, Nuclear Security Summit, and the Negotiation Conference on the TPNW) and official documents published by governments and international organizations.

As for the evaluation section, a set of objective evaluation criteria is established by which the respective country's performance is assessed.

The Research Committee of this project recognizes the difficulties, limitations and risks of "scoring" countries' performances. However, the Committee also considers that an indicative approach is useful to draw attention to nuclear issues, so as to prompt debates over priorities and urgency.

The different numerical value within each category (i.e., nuclear disarmament, nuclear non-proliferation and nuclear security) reflects each activity's importance within that area, as determined through deliberation by the Research Committee of this project. However, the differences in the scoring arrangements within each of the three categories do not necessarily reflect their relative significance in

[1] North Korea declared its suspension from the NPT in 1993 and its withdrawal in 2003, and conducted nuclear tests in 2006, 2009, 2013, twice in 2016, and 2017. However, there is no agreement among the states parties on North Korea's official NPT status.

comparison with others, as it has been driven by the differing number of items surveyed. Thus, the value assigned to nuclear disarmament (full points 101) does not mean that it is more important than nuclear non-proliferation (full points 61) or nuclear security (full points 41).

Regarding "the number of nuclear weapons" (in the nuclear disarmament section) and "the amount of fissile material usable for nuclear weapons" (in the nuclear security section), the assumption is that the more nuclear weapons or weapons-usable fissile material a country possesses, the greater the task of reducing them and ensuring their security. However, the Research Committee recognizes that "numbers" or "amounts" are not the sole decisive factors. It is definitely true that other factors—such as implications of missile defense, chemical and biological weapons, conventional force imbalances and a psychological attachment to a minimum overt or covert nuclear weapon capability—would affect the issues and the process of nuclear disarmament, non-proliferation and nuclear security. However, they were not included in our criteria for evaluation because it was difficult to make objective scales of the significance of these factors. In addition, in view of the suggestions and comments made to *Hiroshima Report 2013*, the Research Committee modified criteria of the following items: current status of the roles and significance of nuclear weapons in national security strategies and policies; relying on extended nuclear deterrence; and nuclear testing. Since the *Hiroshima Report 2014*, these items have been negatively graded if applicable.

As there is no way to mathematically compare the different factors contained in the different areas of disarmament, non-proliferation and nuclear security, the evaluations should be taken as indicative of the performances in general and not as an exact representation or precise assessment of different countries' performances.

The *Hiroshima Report 2019* basically maintains the same structure and items as previous years while one item on the TPNW has been added since the *Hiroshima Report 2018*.

Besides, since the *Hiroshima Report 2019*, the Research Committee adds it as an evaluation item whether respective countries attended the Hiroshima or the Nagasaki Peace Memorial Ceremonies while attendance only on the Hiroshima Peace Memorial Ceremony had been evaluated until the *Hiroshima Report 2018*. (full points 3 in this item remain the same).

Part I Report

Surveying Trends of Nuclear Disarmament, Non-Proliferation and Nuclear Security in 2018

Chapter 1. Nuclear Disarmament[1]

(1) Status of Nuclear Forces (estimates)

As of December 2018, eight countries have declared that they have nuclear weapons. According to Article IV-3 of the Nuclear Non-Proliferation Treaty (NPT), "a nuclear-weapon State is one which has manufactured and exploded a nuclear weapon or other nuclear explosive device prior to 1 January 1967." China, France, Russia, the United Kingdom, and the United States meet this requirement, and have acceded to the NPT as nuclear-weapon states (NWS) as defined by the treaty. The three other countries that have tested nuclear weapons and declared having them are India, Pakistan and North Korea. India and Pakistan have never been parties to the NPT. Israel, a non-NPT state, has maintained a policy of "nuclear ambiguity" by neither confirming nor denying having nuclear weapons, although it is widely considered that it has them (no conclusive evidence has emerged that Israel has conducted a nuclear test). In this report, these four additional states that have publicly declared or are believed to possess nuclear weapons are referred to as "other nuclear-armed states." In 2003 North Korea declared withdrawal from the NPT, and acquisition of nuclear weapons.

The number of nuclear weapons, which grew to approximately 70,000 at the peak of the Cold War era, has been reduced steadily since the late 1980s. According to the estimates produced by the Stockholm International Peace Research Institute (SIPRI), however, an estimated 14,465 nuclear weapons still exist on the earth, and the U.S. and Russian nuclear stockpiles together constitute more than 90 percent of the total. [2] Compared to the approximately 8,100 nuclear weapons that were eliminated between 2010 and 2018, the 470 nuclear weapons eliminated between 2017 and 2018 indicates that the pace of reduction has been slowing. It is widely estimated that China, India and Pakistan have each added about 10 warheads annually for the past several years (see Tables 1-1 and 1-2).

[1] This chapter is written by Hirofumi Tosaki.

[2] Stockholm International Peace Research Institute, *SIPRI Yearbook 2018: Armaments, Disarmament and International Security* (Oxford: Oxford University Press, 2018), chapter 6.

Table 1-1: Number of nuclear weapons—2010-2018

	2010	2011	2012	2013	2014	2015	2016	2017	2018
China	240	240	240	250	250	260	260	270	280
France	300	300	300	300	290	290	300	300	300
Russia	12,000	11,000	10,000	8,500	8,000	7,500	7,290	7,000	6,850
U.K.[a]	225	225	225	225	225	215	215	215	215
U.S.	9,600	8,500	8,000	7,700	7,300	7,260	7,000	6,800	6,450
India	60-80	80-100	80-100	90-110	90-110	90-110	100-120	120-130	130-140
Pakistan	70-90	90-110	90-110	100-120	100-120	100-120	110-130	130-140	140-150
Israel	80	80	80	80	80	80	80	80	80
North Korea	?	?	?	6-8	8	8	10	10-20	10-20
Total	22,600	20,530	19,000	17,270	16,383	15,850	15,395	14,935	14,465

Sources: Stockholm International Peace Research Institute (SIPRI), *SIPRI Yearbook 2010: Armaments, Disarmament and International Security* (Oxford: Oxford University Press, 2010), chapter 8; SIPRI, S*IPRI Yearbook 2011: Armaments, Disarmament and International Security* (Oxford: Oxford University Press, 2011), chapter 7; SIPRI, *SIPRI Yearbook 2012: Armaments, Disarmament and International Security* (Oxford: Oxford University Press, 2012), chapter 7; SIPRI, *SIPRI Yearbook 2013: Armaments, Disarmament and International Security* (Oxford: Oxford University Press, 2013), chapter 7; SIPRI, SIPRI *Yearbook 2014: Armaments, Disarmament and International Security* (Oxford: Oxford University Press, 2014), chapter 6; SIPRI, *SIPRI Yearbook 2015: Armaments, Disarmament and International Security* (Oxford: Oxford University Press, 2015), chapter 11; SIPRI, *SIPRI Yearbook 2016: Armaments, Disarmament and International Security* (Oxford: Oxford University Press, 2016), chapter 16; SIPRI, *SIPRI Yearbook 2017: Armaments, Disarmament and International Security* (Oxford: Oxford University Press, 2017), chapter 11; SIPRI, *SIPRI Yearbook 2018: Armaments, Disarmament and International Security* (Oxford: Oxford University Press, 2018), chapter 6.

a) The United Kingdom, according to a document obtained under the freedom of information act, "has been decommissioning and breaking down Trident nuclear warheads at a rate of three per year, with a goal of reducing domestic stocks to 'no more than 180' by the mid-2020s," at Burghfield in Berkshire (Rob Edwards, "UK's Nuclear Weapons being Dismantled Under Disarmament Obligations," *Guardian*, August 11, 2013, http://www.theguardian.com/uk-news/2013/aug/11/uk-nuclear-weapons-dismantled-trident.). While the SIPRI estimated that the United Kingdom possessed 225 nuclear weapons from 2010 through 2014, it could be assumed that it had reduced the number of nuclear weapons gradually.

Table 1-2: The status of nuclear forces (estimates, as of January 2018)

	Total nuclear stockpile	Breakdown			Nuclear warheads	Delivery vehicles
U.S.	6,450	Retired / Awaiting dismantlement 2,650				
		Operational 3,800	Non-deployed 2,050			
			Deployed 1,750	Non-strategic 200		
				Strategic 3,600	ICBM	800	400
					SLBM	1,920	240
					Strategic bomber	880	60
Russia	6,850	Retired / Awaiting dismantlement 2,500	（Non-strategic）（1,830）			
		Operational 4,350	Non-deployed 2,750	（Non-strategic）（1,830）		
			Deployed 1,600	Strategic 2,520	ICBM	1,138	318
					SLBM	768	176
					Strategic bomber	616	50
U.K.	215		Deployed 120		SLBM	215	48
France	300		Deployed 290		SLBM	240	48
					Attack aircraft（including carrier based aircraft）	50	50
China	280				Land-based ballistic missile	186	151
					SLBM	48	48
					Attack aircraft	20	20
					Cruise missile	n/a	n/a
India	130-140				Land-based ballistic missile	68	68
					Attack aircraft	48	48
					SLBM	16	14
Pakistan	140-150				Land-based ballistic missile	102	102
					Attack aircraft	36	36
					Cruise missile	12	12
Israel	80				Cruise missile		
					Attack aircraft		
N. Korea	10-20						
World	14,465		（Deployed）（3,750）				

ICBM：Inter-Continental Ballistic Missile　SLBM：Submarine Launched Ballistic Missile
Source: Stockholm International Peace Research Institute, *SIPRI Yearbook 2018: Armaments, Disarmament and International Security* (Oxford: Oxford University Press, 2017), chapter 6.

Among nuclear-armed states, France declared it possesses 300 nuclear weapons,[3] and the United Kingdom announced plans to reduce its total nuclear stockpiles to not more than 180 by the mid-2020s. Other countries have not declassified the exact number of nuclear weapons in their arsenal.[4] Meanwhile, the United States has recently declassified information more actively. According to the most recent information released by the U.S. Department of Defense, the U.S. nuclear weapons stockpile dropped to 3,822 warheads (retired weapons awaiting dismantlement are not included in the totals) by September 2017—down 196 warheads from the last year of the Obama administration.[5] Department of Defense also disclosed that the United States dismantled 354 nuclear weapons in 2017, up from 258 the year before.[6]

(2) Commitment to Achieving a World without Nuclear Weapons

A) Approaches toward a world without nuclear weapons

According to the preamble of the NPT, states parties "[declare] their intention to achieve at the earliest possible date the cessation of the nuclear arms race and to undertake effective measures in the direction of nuclear disarmament, [and urge] the co-operation of all States in the attainment of this objective." Article VI of the Treaty stipulates that "[e]ach of the Parties to the Treaty undertakes to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a treaty on general and complete disarmament under strict and effective international control."

As mentioned in the previous *Hiroshima Reports*, no country, including the nuclear-armed states, openly opposes the goal of the total elimination of nuclear weapons or the vision of a world without nuclear weapons. The commitment to nuclear disarmament has been reiterated in various fora, including the NPT review process and the UN General Assembly (UNGA). However, such statements do not necessarily mean that nuclear-armed states actively pursue realization of a world without nuclear weapons. The stalemate in nuclear disarmament continued again in 2018.

As for approaches to nuclear disarmament,

[3] In addition, France reports that "[i]t has no undeployed weapons. All of its weapons are deployed and operational." NPT/CONF.2015/10, March 12, 2015.

[4] On this point, Bruno Tertrais explains the reasons as following: "Stockpiles include weapons which are not entirely functional (when exactly does an atomic device become a 'nuclear weapon'?), or which are used for non-destructive testing. As a result, giving an exact number can be difficult, misleading, and/or be accurate just for a given day." Bruno Tertrais, "Comments on Hiroshima Report of March 2013," *Hiroshima Report Blog: Nuclear Disarmament, Nonproliferation and Nuclear Security*, October 29, 2013, http://hiroshima-report. blogspot. jp/2013/10/op-ed-bruno-tertrais-comments-on.html.

[5] Hans M. Kristensen, "Despite Rhetoric, US Stockpile Continues to Decline," Federation of American Scientists, March 22, 2018, https://fas.org/blogs/security/2018/03/stockpile-reduction/.

[6] Department of Defense, "Stockpile Numbers: End of Fiscal Years 1962-2017," http://open.defense.gov/Portals/23/Documents/frddwg/2017_Tables_UNCLASS.pdf.

the five NWS and India have argued for a step-by-step approach;[7] non-nuclear-weapon states (NNWS) allied with the United States (nuclear umbrella states) have proposed a progressive approach based on building-block principles; and the Non-Aligned Movement (NAM) countries have called for launching negotiations on a phased program for the complete elimination of nuclear weapons within a specified time frame.[8] the 2018 NPT Preparatory Committee (PrepCom), the New Agenda Coalition (NAC) emphasized that "the measures agreed upon in 1995, 2000 and 2010 represent clear indicators of what States parties to the Non-Proliferation Treaty have agreed as necessary for the implementation of the nuclear disarmament obligation in Article VI. States parties to the Non-Proliferation Treaty remain fully accountable for the implementation of those agreed disarmament measures."[9] The NAM states consistently argued "the urgent necessity of negotiating and bringing to a conclusion a phased programme for the complete elimination of nuclear weapons with a specified time frame."[10] At the PrepCom, Japan's Foreign Minister Taro Kono stated:

> Threats of nuclear weapons still exist, however and the security environment is deteriorating. A sovereign State must protect lives and properties of her people. We need to seek security and nuclear disarmament simultaneously. We need to avoid the humanitarian consequences of the use of nuclear weapons and to deal with real security threats. We need to strike a balance of these two viewpoints, creating concrete and practical measures under the cooperation of both nuclear-weapon states and non-nuclear-weapon states. As the most universal framework that enables such balance, maintaining and strengthening the NPT will be the core of Japan's efforts.

He also introduced the recommendations submitted by "the Group of Eminent Persons for Substantive Advancement of Nuclear Weapons" for building bridges between NWS and NNWS, and emphasized the necessity of (1) transparency, (2) a nuclear disarmament verification mechanism, and (3) interactive discussion involving both nuclear-weapon and non-nuclear-weapon States, and called for active efforts and discussion by the NPT state parties.[11]

The relationship between security and humanitarian dimensions in nuclear

[7] Russia's Deputy Foreign Minister Sergei Ryabkov said in June 2018, "We believe that such initiatives are premature," the diplomat said. "We call for the nuclear disarmament task to be addressed in a sensible and realistic way. Movement towards nuclear disarmament should be reasonable and gradual." "Diplomat Says too Early to Embark on Global Nuclear Disarmament Process," *Tass*, June 14, 2018, http://tass.com/politics/1009436.

[8] Regarding each country's approach, see the *Hiroshima Report 2017*.

[9] NPT/CONF.2020/PC.II/WP.13, March 15, 2018.

[10] NPT/CONF.2020/PC.II/WP.17, March 23, 2018.

[11] "Statement by H.E. Mr. Taro Kono, Minister for Foreign Affairs," General Debate, 2018 NPT PrepCom, April 24, 2018. See also the Group of Eminent Persons for Substantive Advancement of Nuclear Disarmament, *Building Bridges to Effective Nuclear Disarmament: Recommendations for the 2020 Review Process for the Treaty on the Non-Proliferation of Nuclear Weapons*, March 2018, https://www.mofa.go.jp/mofaj/files/000403717.pdf.

disarmament has been one of the important issues in recent discussions. The United States, which has emphasized the importance of security dimensions, submitted a working paper in which it proposed a Creating the Conditions for Nuclear Disarmament (CCND) approach. It argued:

> If we continue to focus on numerical reductions and the immediate abolition of nuclear weapons, without addressing the real underlying security concerns that led to their production in the first place, and to their retention, we will advance neither the cause of disarmament nor the cause of enhanced collective international security… This new approach to disarmament diplomacy envisages all parties to the Treaty contributing to efforts to ease conflicts and rivalries that lead to the continued reliance on nuclear weapons and nuclear deterrence… This concept of easing tension between and among States, including through effective measures that build trust and confidence, is the necessary starting point for fostering the conditions for nuclear disarmament, in accordance with Article VI of the Treaty.[12]

At the international conference in December 2018, U.S. Assistant Secretary Christopher Ashley Ford stated that Washington would establish a "Creating the Conditions Working Group (CCWG)," aiming to "identify aspects of the real world security environment that present major obstacles to further disarmament movement and to develop specific proposals for how those obstacles might be overcome." According to his presentation, "the CCWG would consist of perhaps 25 to 30 countries selected on the basis of both regional and political diversity, and united both by the understanding that further progress on disarmament requires addressing the security issues which impede it, and by a shared commitment to finding ways to do so."[13] The NAC criticized the CCND approach, and argued: "it is the implementation of existing nuclear disarmament obligations and commitments that will contribute to improving the global environment."[14]

On the other hand, countries which have strongly advocated the humanitarian dimensions of nuclear weapons, including NAC and NAM, argued that the security environment should not be used as an excuse for not implementing nuclear disarmament.

In May 2018, UN Secretary-General António Guterres delivered a report, titled *Securing Our Common Future: An Agenda for Disarmament*, in which, regarding nuclear issues, he emphasized the significance of resuming dialogue and negotiations for nuclear arms control and disarmament, extending the norms

[12] NPT/CONF.2020/PC.II/WP.30, April 18, 2018. On the other hand, the U.S. general statement at the 2018 PrepCom focused almost solely on nuclear non-proliferation. This implies that the U.S. current administration does not consider the other two so-called pillars of the NPT—nuclear disarmament and peaceful use of nuclear energy – to have equal importance. "Statement by the United States," General Debate, Second Session of the Preparatory Committee for the 2020 NPT Review Conference [hereafter 2018 PrepCom], April 23, 2018.

[13] Christopher Ashley Ford, Assistant Secretary, "The P5 Process and Approaches to Nuclear Disarmament: A New Structured Dialogue," Conference on "The Nuclear Nonproliferation Regime—Towards the 2020 NPT Review Conference," Wilton Park, December 10, 2018, https://www.state.gov/t/isn/rls/rm/2018/288018.htm.

[14] NPT/CONF.2020/PC.II/WP.13, March 15, 2018.

against nuclear weapons and their proliferation, and preparing for a world free of nuclear weapons.[15] He also stated in his presentation on launch of the report:

> I appeal to all states, including non-parties, to adhere to the non-proliferation and disarmament obligations and commitments under the NPT. All States, nuclear and non-nuclear, must work together to bridge the gulf that divides them. Some characterize the differences as a choice between humanitarian and security concerns. But that is a false dichotomy. Human security, national security and global security are indivisible. When people fear for their lives, their communities, societies and countries are at increased risk. When people enjoy safety, so do their countries and the world.[16]

B) Voting behavior on UNGA resolutions on nuclear disarmament proposals by Japan, NAC and NAM

In 2018, the UNGA again adopted resolutions titled: "United action with renewed determination towards the total elimination of nuclear weapons"[17] proposed by Japan and others; "Towards a nuclear-weapon-free world: accelerating the implementation of nuclear disarmament commitments"[18] proposed by the New Agenda Coalition (NAC); and "Nuclear disarmament"[19] by NAM members. The voting behavior of the countries surveyed in this project on the three resolutions at the UNGA in 2018 is presented below.

- "United action with renewed determination towards the total elimination of nuclear weapons"
  - Proposing: Australia, Germany, Japan, Poland and others
  - 162 in favor, 4 Against (China, Russia, North Korea and Syria), 23 Abstentions (Austria, Brazil, Egypt, France, India, Indonesia, Iran, Israel, South Korea, Mexico, New Zealand, Nigeria, Pakistan, South Africa, the U.S. and others)

- "Towards a nuclear-weapon-free world: accelerating the implementation of nuclear disarmament commitments" (NAC)
  - Proposing: Austria, Brazil, Egypt, Mexico, New Zealand, South Africa and others
  - 139 in favor, 23 Against (Belgium, China, France, Germany, India, Israel, the Netherlands, Norway, Poland, Russia, Turkey, the U.K. and the U.S.), 17 Abstentions (Australia, Canada, Japan, South Korea, North Korea, Pakistan and others)

[15] Office for Disarmament Affairs, *Securing Our Common Future: An Agenda for Disarmament*, 2018, pp. 15-24.

[16] António Guterres, "Remarks at the University of Geneva on the launch of the Disarmament Agenda," May 24, 2018, https://www.un.org/sg/en/content/sg/speeches/2018-05-24/launch-disarmament-agenda-remarks.

[17] A/RES/73/62, December 5, 2018.

[18] A/RES/73/70, December 5, 2018.

[19] A/RES/73/50, December 5, 2018.

Table 1-3: Voting behavior on selected UNGA resolutions in 2018

	United action towards the total elimination of nuclear weapons	Towards a nuclear-weapon-free world	Nuclear disarmament	TPNW	Follow-up to the advisory opinion of the ICJ	Convention on the Prohibition of the Use of Nuclear Weapons	Humanitarian consequences	Ethical imperatives
China	×	×	○	×	○	○	△	△
France	△	×	×	×	×	×	×	×
Russia	×	×	×	×	×	△	×	×
U.K.	○	×	×	×	×	×	×	×
U.S.	△	×	×	×	×	×	×	×
India	△	×	△	×	△	○	○	△
Israel	△	×	×	×	×	×	×	×
Pakistan	△	△	△	×	○	○	△	△
Australia	○	△	×	×	×	×	△	×
Austria	△	○	△	○	○	×	○	○
Belgium	○	×	×	×	×	×	△	×
Brazil	△	○	○	○	○	△	○	○
Canada	○	△	×	×	△	×	△	×
Chile	○	○	?	○	○	○	○	○
Egypt	△	○	○	○	○	○	○	○
Germany	○	×	×	×	×	×	△	×
Indonesia	○	○	○	○	○	○	○	○
Iran	△	○	○	○	○	○	○	○
Japan	○	△	△	×	△	△	○	△
Kazakhstan	○	○	○	○	○	○	○	○
South Korea	△	△	×	×	×	×	×	×
Mexico	△	○	○	○	○	○	○	○
Netherlands	○	×	×	×	×	×	△	×
New Zealand	△	○	△	○	○	×	○	○
Nigeria	△	○	○	○	○	○	○	○
Norway	○	×	×	×	×	×	△	×
Philippine	○	○	○	○	○	△	○	○
Poland	○	×	×	×	×	×	×	×
Saudi Arabia	○	○	○	○	○	○	○	○
South Africa	△	○	△	○	○	○	○	○
Sweden	○	○	△	△	○	×	○	△
Switzerland	○	○	○	△	○	×	○	△
Syria	×	○	○	?	○	○	○	○
Turkey	○	×	×	×	×	×	×	×
UAE	○	○	○	○	○	○	○	○
North Korea	×	△	○	△	△	○	△	△

[○: Favor, ×: Against, △: Abstention, ?:Not voting]

- "Nuclear disarmament" (NAM)
  - Proposing: Brazil, Indonesia, the Philippines and others
  - 125 in favor, 40 Against (Australia, Belgium, Canada, France, Germany, Israel, South Korea, the Netherlands, Norway, Poland, Russia, Turkey, the U.K., the U.S. and others), 18 Abstentions (Austria, India, Japan, New Zealand, Pakistan, South Africa, Sweden and others) * Chile did not vote.

Regarding the resolution titled "United action towards the total elimination of nuclear weapons," among nuclear-armed states, France and the United States changed their positions from the previous year, when they voted in favor, and abstained in 2018. In addition, many countries taking an initiative to make the Treaty on the Prohibition of Nuclear Weapons (TPNW) also abstained, arguing that the treaty was not mentioned in the resolution. Still, the overall number of countries in favor increased by six from the previous year.

C) Humanitarian consequences of nuclear weapons

Since the 2015 NPT Review Conference, the Humanitarian Group, which focuses on the humanitarian dimensions of nuclear weapons, has emphasized the significance of starting negotiations of a legally binding instrument on prohibiting nuclear weapons. The result was the adoption of the TPNW in 2017.

The Humanitarian Group and Austria submitted working papers on humanitarian consequences of nuclear weapons at the 2018 NPT PrepCom, respectively. In its working paper, the Humanitarian Group—including Austria, Brazil, Chile, Egypt, Indonesia, Mexico, New Zealand, Nigeria, the Philippines, South Africa—"commit[ed] to further enhancing awareness of the humanitarian impact of and risks associated with nuclear weapons with a view to increasing the urgency with which a world without nuclear weapons is pursued and achieved"; and "call[ed] on the nuclear-weapon States…to take concrete interim measures with urgency to reduce the risk of nuclear weapon detonations and to increase their transparency and accountability in this regard." It also expressed its recognition that "new evidence that has emerged about the humanitarian consequences of nuclear weapons lends further strength to the view that these weapons cannot be used in conformity with international law, in particular international humanitarian law"; and "the risk of nuclear weapons' use can be avoided only through the total elimination of nuclear weapons and maintenance of a world free of nuclear weapons, which is an objective of the [NPT] and the [TPNW], the latter being an effective legal measure under Article VI of the [NPT]."[20]

On the other hand, NWS nuclear-weapon states have kept their distance from humanitarian issues in nuclear disarmament. At the 2018 NPT PrepCom, no NWS used the word

[20] NPT/CONF.2020/PC.II/WP.9, March 9, 2018. See also a working paper submitted by Austria (NPT/CONF.2020/PC.II/WP.10, March 12, 2018).

"humanitarian" in speeches at the general debate and Cluster 1 on nuclear disarmament. Nor did they refer to the humanitarian dimensions on nuclear weapons in the joint statement of the NWS conference held in October.[21] As for the UN General Assembly resolution, "United action with renewed determination towards the total elimination of nuclear weapons," led by Japan, proponents of the TPNW, including NGOs and *Hibakusha*, took issue with the removal of the word "any" in the 2017 resolution phrasing, which in 2016 read: "[e]xpressing deep concern at the catastrophic humanitarian consequences of any use of nuclear weapons." They called the removal an unacceptable step backward. The term "any" again was not used in the resolution in 2018.

At the 2018 UNGA, Austria and other co-sponsors, as in the previous year, proposed a resolution titled "Humanitarian consequences of nuclear weapons."[22] The voting behavior of countries surveyed in this project on this resolution is presented below.

- Proposing: Austria, Brazil, Chile, Egypt, Indonesia, Kazakhstan, Mexico, New Zealand, Nigeria, the Philippines, South Africa, Sweden, Switzerland and others
- 142 in favor, 15 Against (France, Israel, South Korea, Poland, Russia, Turkey, the U.K., the U.S. and others), 26 Abstentions (Australia, Belgium, Canada, China, Germany, North Korea, the Netherlands, Norway, Pakistan and others)

Furthermore, the voting behavior of the resolution titled "Ethical imperatives for a nuclear-weapon-free world"[23] led by South Africa was:

- Proposing: Austria, Brazil, Egypt, Mexico, Nigeria, South Africa and others
- 136 in favor, 36 Against (Australia, Belgium, Canada, France, Germany, Israel, South Korea, the Netherlands, Norway, Poland, Russia, Turkey, the U.K., the U.S. and others), 14 Abstentions (China, India, Japan, North Korea, Pakistan, Sweden, Switzerland and others)

(3) Treaty on the Prohibition of Nuclear Weapons (TPNW)

The number of countries which have signed and/or ratified the TPNW has steadily increased. As of the end of 2018, 19 countries have ratified (c.f., three countries in 2017) among the 69 signatories (56 countries in 2017). Austria, Mexico, New Zealand and others have already ratified the treaty. Signatory countries include Brazil, Chile, Indonesia, Kazakhstan, Nigeria, the Philippines and South Africa. The treaty enters into force after the fiftieth instrument of ratification, acceptance, approval or accession is deposited.

[21] "P5 Joint Statement on the Treaty on the Non-Proliferation of Nuclear Weapons," October 24, 2018, https://www.gov.uk/government/news/p5-joint-statement-on-the-treaty-on-the-non-proliferation-of-nuclear-weapons.

[22] A/RES/73/47, December 5, 2018.

[23] A/RES/73/68, December 5, 2018.

At the 2018 UNGA, a resolution was adopted titled "Treaty on the Prohibition of Nuclear Weapons," which called for signing and ratifying the treaty.[24] The voting behavior of countries surveyed in this project on this resolution is presented below.

- Proposing: Austria, Brazil, Chile, Indonesia, Kazakhstan, Mexico, New Zealand, Nigeria, the Philippines, South Africa and others
- 126 in favor, 41 Against (Australia, Belgium, Canada, China, France, Germany, India, Israel, Japan, South Korea, the Netherlands, Norway, Pakistan, Poland, Russia, Turkey, the U.K., the U.S. and others), 16 Abstentions (North Korea, Sweden, Switzerland and others) *Syria did not vote.

Proponents of the TPNW have emphasized its significance in moving toward the goal of a total elimination of nuclear weapons. For instance, Austria stated: "The treaty is an impressive manifestation of the view of the large majority of the world's States that nuclear weapons, far from providing security, due to the catastrophic humanitarian consequences of their use, are actually an existential threat for humanity."[25] It also argued that "[a]s an important contribution to implementing article VI, the TPNW is fully consistent with the NPT, the cornerstone of the international nuclear disarmament and non-proliferation regime, and strengthens the implementation of Art. VI…TPNW is one of the effective legal measures necessary for the fulfilment of article VI."[26] The chairperson of the 2018 NPT PrepCom also mentioned: "It was asserted that the TPNW represented an effective measure under Article VI of the NPT by creating a legally binding prohibition on nuclear weapons. It was stressed that the TPNW complemented the NPT and was designed to strengthen existing disarmament and nuclear non-proliferation regimes."[27]

On the other hand, nuclear-armed states and their allies maintained their position not to sign the TPNW. In October 2018, the five NWS issued a joint statement, in which they explained their opposition to the treaty:[28]

> The TPNW fails to address the key issues that must be overcome to achieve lasting global nuclear disarmament. It contradicts, and risks undermining, the NPT. It ignores the international security context and regional challenges, and does nothing to increase trust and transparency between States. It will not result in the elimination of a single weapon. It fails to meet the highest standards of non-proliferation. It is creating divisions across the international non-proliferation and disarmament machinery, which could make further progress on disarmament even

[24] A/RES/73/48, December 5, 2018.

[25] "Statement by Austria," General Debate, 2018 NPT PrepCom, April 23, 2018.

[26] Ibid. See also "Statement by New Zealand," General Debate, 2018 NPT PrepCom, April 23, 2018.

[27] NPT/CONF.2020/PC.II/WP.41, May 16, 2018.

[28] "P5 Joint Statement on the Treaty on the Non-Proliferation of Nuclear Weapons," October 24, 2018, https://www.gov.uk/government/news/p5-joint-statement-on-the-treaty-on-the-non-proliferation-of-nuclear-weapons.

more difficult.

At the 2018 NPT PrepCom, France argued that "[i]t would be dangerous to believe that it is possible to consider the issues of nuclear disarmament without taking into account the security context." Harshly criticizing the treaty, France said:

> That is why France opposes the Treaty on the Prohibition of Nuclear Weapons (TPNW), which was hastily negotiated last year in total ignorance of the worsening strategic context and the role that nuclear deterrence continues to play in preserving international and regional security and stability, including in Europe and Asia. The TPNW could undermine the NPT as the cornerstone of the international non-proliferation regime by creating an alternative and contrary standard. As it dissociates itself from the goal of general and complete disarmament, which is central to the Article VI of the NPT, the Treaty could lead to a race to develop conventional capabilities and consequently military escalation. As it is exclusively based on a humanitarian, and in fact largely moralistic approach, this Treaty deepens divisions and tends to undermine the very foundations of multilateralism, namely dialogue and cooperation with a view to reaching consensus.[29]

Other NWS—except China, which did not touch upon the TPNW in its statements at the PrepCom or UNGA—also insisted as follows:

- Russia: "[W]e consider attempts to focus the disarmament process on unconditional abolition of nuclear arsenals as soon as possible to be premature and disorienting. There is no way to reach the goal of building a world free of nuclear weapons by the methods that formed the basis of the Treaty on the Prohibition of Nuclear Weapons, which now is open for signature."[30]
- U.K.: "[T]he UK has not and will not become a party to the treaty and does not recognise its prohibitions as representing an emerging rule of customary international law."[31]
- U.S.: "[T]he TPNW is clearly a colossal mistake — one that illustrates, once again, how good intentions and enthusiasm, even in the best of causes, can sometimes produce very perverse and problematic outcomes. If we really want to make the world a genuinely safer and saner place, and bring about the verified and sustainable elimination of nuclear weaponry, we all need to do rather better than that.[32]

Switzerland, which had approved the conclusion of the TPNW in July 2017, decided to analyze and evaluate it via an interdepartmental group whether the TPNW cohere with its national law and the NPT, as well as whether prohibition is the best method for achieving

[29] "Statement by France," Cluster I, 2018 NPT PrepCom, April 25, 2018.

[30] "Statement by Russia," General Debate, 2018 NPT PrepCom, April 24, 2018.

[31] "Statement by the United Kingdom," General Debate, 2018 NPT PrepCom, April 24, 2018.

[32] Christopher Ashley Ford, "The Treaty on the Prohibition of Nuclear Weapons: A Well-Intentioned Mistake," Advancing Disarmament in an Increasingly Dangerous World, University of Iceland, Reykjavik, Iceland, October 30, 2018, https://www.state.gov/t/isn/rls/rm/2018/287082.htm.

nuclear disarmament. Meanwhile, Ambassador Sabrina Dallafior, Permanent Representative of Switzerland to the Conference on Disarmament, said, "We are not sure that this treaty will really be a step towards the elimination of nuclear weapons because the countries which have the atomic bomb are not a party to it, although we are convinced that they should be implicated, them and their allies. This treaty should not be against them but with them."[33] In August 2018, the Swiss government issued a report, in which it decided not to sign the treaty—but, at the same time, considered that Switzerland should attend the first meeting of States Parties as an observer—since "in the current international context, the TPNW entails risks in terms of both the continued advancement of disarmament diplomacy and Switzerland's security policy interests."[34] On the other hand, in December, the Swiss parliament adopted a resolution in which it urged the government to debate for signing and ratifying the TPNW.

In October, the Norwegian government in its national budget released a report on the TPNW, which concluded that Norway would not sign the treaty for now because it would contradict its policy relying on extended nuclear deterrence.

The UNGA resolution titled "Follow-up to the advisory opinion of the International Court of Justice on the Legality of the Threat or Use of Nuclear Weapons" was adopted, as was done in previous years.[35] It says that "by commencing multilateral negotiations leading to an early conclusion of a nuclear weapons convention" all states should implement the obligation in Article VI of the NPT. The voting behavior in 2018 was as follows:

- Proposing: Egypt, Iran, the Philippines and others;
- 138 in favor, 32 Against (Australia, Belgium, France, Germany, Israel, South Korea, the Netherlands, Norway, Poland, Russia, Turkey, the U.K., the U.S. and others), 17 Abstentions (Canada, India, Japan, North Korea and others)

In addition, a UNGA resolution titled "Convention on the Prohibition of the Use of Nuclear Weapons," requesting "to the Conference on Disarmament to commence negotiations in order to reach agreement on an international convention prohibiting the use or threat of use of nuclear weapons under

[33] Frédéric Burnand, "Why Switzerland Hasn't (yet) Signed the Treaty Banning Nuclear Weapons," *Swissinfo*, March 19, 2018, https://www.swissinfo.ch/eng/disarmament_why-switzerland-hasn-t-signed-the-treaty-banning-nuclear-weapons--yet-/43982398.

[34] Federal Department of Foreign Affairs of Switzerland, "Report of the Working Group to Analyse the Treaty on the Prohibition of Nuclear Weapons," June 30, 2018, https://www.eda.admin.ch/dam/eda/en/documents/aussenpolitik/sicherheitspolitik/2018-bericht-arbeitsgruppe-uno-TPNW_en.pdf; "The Federal Council Decides Not to Sign the Treaty on the Prohibition of Nuclear Weapons at the Present Time," Portal of the Swiss Government, August 15, 2018, https://www.admin.ch/gov/en/start/documentation/media-releases.msg-id-71821.html.

[35] A/RES/73/64, December 5, 2018.

any circumstances," was also proposed and adopted.[36] Voting behavior on this resolution was as follows:

- Proposing: India and others;
- 124 in favor, 50 Against (Australia, Austria, Belgium, Canada, France, Germany, Israel, South Korea, the Netherlands, New Zealand, Norway, Poland, Sweden, Switzerland, Turkey, the U.K., the U.S. and others), 13 Abstentions (Brazil, Japan, the Philippines, Russia and others).

[36] A/RES/73/74, December 5, 2018.

Column 1

Towards the 2020 NPT Review Conference

Evaluation of Progress of the Treaty Prohibiting Nuclear Weapons, 2017 (TPNW)

Tim Caughley

> *"The [2010 NPT Review] Conference resolves to seek a safer world for all and to achieve the peace and security of a world without nuclear weapons, in accordance with the objectives of the Treaty."* (First principle and objective of the NPT Action Plan agreed by all NPT Parties, 2010: NPT/CONF.2010/50 (Vol. I))

This column has two themes: (a) progress towards bringing the TPNW into force; and (b) possible impacts of the TPNW on the 2020 NPT Review Conference.

(a) The TPNW was adopted by 122 Member States of the United Nations on 7 July 2017 at the end of a United Nations Conference that was open to all 193 UN Members. By the end of 2018, the TPNW had attracted 19 contracting States. This represents steady progress to the target of 50 parties to make the treaty *legally* effective. Of course, in terms of its *normative* impact, the TPNW is already widely seen as emulating the prohibitions on both the other classes of weapons of mass destruction (WMD)—biological and toxin weapons (BTWC) and chemical weapons (CWC). It meshes too with one of the three priorities of the UN Secretary-General's new disarmament agenda—saving humanity by eliminating WMD.

(b) Pending the TPNW's entry into force, measuring its influence as a driver for achieving the elimination of nuclear armaments is necessarily speculative. For the meantime, the debate on the TPNW's effectiveness is a highly charged one (although it needs to be remembered that the negotiation of the TPNW was a symptom, not a cause, of this long-standing deadlock). Its

impact is seen by possessors of nuclear weapons and many of their military allies as calling into question the legitimacy they attach to this sole remaining category of WMD, one which, in their eyes, underpins global security through its capacity to deter aggression by enemy States. They didn't participate in the TPNW negotiations for that reason.

On the other hand, a large number of States that committed themselves under the NPT never to possess nuclear weapons reject the notion that global security depends on the existence of such inhumane weapons. These States see the TPNW as reinforcing the NPT's atrophying nuclear disarmament arm. They argue that:

(i) in recent years, the modernisation of nuclear arsenals has raised the possibility that these weapons would actually be used in conflict, unleasing catastrophic humanitarian consequences. Any repeat of the scale of loss of human life and ongoing health and environmental effects of radiation contamination as suffered through the bombings of Hiroshima and Nagasaki is regarded as unconscionable. Moreover, current nuclear posturing is widely viewed as *endangering* global security rather than *guaranteeing* it;

(ii) progress towards nuclear disarmament by nuclear-armed States nearly 50 years since the NPT entered into force has been slow and at times grudging;

(iii) continued reliance on nuclear weapons for security purposes by nuclear-armed States and their allies perpetuates a fundamental tension between those that choose to rely on nuclear weapons for their security and those that, under the NPT, have foresworn those weapons.

These divergent viewpoints are bitterly contested. This will remain the case at the NPTRC in 2020 even if the TPNW has entered into force by then. Progress will not be easy. But given that the previous review of the NPT in 2015 ended in failure, all parties to the NPT, whether nuclear-armed or not, should at least agree that continued stand-off at the 2020 Review is in no-one's interest. Openness to rational, restrained debate will be key to finding a solution. Possible groundwork that could be laid in the Review includes:

- bringing greater understanding of nuclear doctrines,
- taking nuclear weapons off hair-trigger alert,
- exploring other means for reducing nuclear risks, and
- seeking security at lower levels of nuclear arms.

It is inconsequential whether nuclear-armed States continue to spurn the carefully constructed mechanisms in the TPNW for their eventual adherence to that Treaty. What is important is that the 2020 Review recognises the urgency of revitalising the NPT and stimulates nuclear disarmament, at the same time preventing the spread of nuclear weapons in the spirit of the 2010 NPT Action Plan as cited at the beginning of this column.

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Column 2

The TPNW and the Challenges of Nuclear Disarmament Verification

Tytti Erästö

One of the main criticisms of the 2017 Treaty on the Prohibition of Nuclear Weapons (TPNW) has been its vagueness regarding disarmament verification. The treaty leaves crucial questions regarding the scope of prohibited activities, materials and facilities, as well as the methods of verification, largely unaddressed. At the same time, this lack of specificity has allowed for a more flexible approach to verification, meaning that important decisions on complex verification solutions can be deferred until a time when nuclear-armed states are ready to engage in the discussion.

Indeed, an enormous amount of work lies ahead in tackling the technical, political and institutional challenges related to nuclear disarmament verification. This work—as well as decisions on how to integrate the existing verification tools and solutions into one comprehensive framework—must eventually include both nuclear-armed states and non-nuclear weapon states. With the prospect of the entry into force of the TPNW as a real possibility in the near or medium-term, there is an increasing need to bridge the current divide among the members of the 1968 Treaty on the Non-proliferation of Nuclear Weapons (NPT) to allow for serious thinking on how such a comprehensive nuclear disarmament verification regime might look.[1]

Verification provisions in the TPNW

The TPNW, which was negotiated with the purpose of strengthening the disarmament pillar of the NPT, is the first legally binding agreement to prohibit the development, deployment,

[1] The TPNW will enter into force 90 days after 50 states have either ratified or acceded to it. As of March 2019, the treaty had been signed by 70 states and ratified by 22.

possession, use and the threat of use of nuclear weapons. Its core prohibitions also include the stationing of nuclear weapons on states parties' territory, as well as the assistance, encouragement or inducement of any activity prohibited by the treaty.

The TPNW does not create a new verification regime. Instead, it stipulates that non-nuclear weapon states maintain their existing International Atomic Energy Agency (IAEA) safeguards obligations 'without prejudice to any additional relevant instruments'. Nuclear-armed states joining the TPNW are to cooperate with what the treaty calls a 'competent international authority or authorities' to enable the verified and irreversible elimination of their nuclear-weapon programmes. After verified disarmament, they must also conclude a safeguards agreement with the IAEA 'sufficient to provide credible assurance of the non-diversion of declared nuclear material from peaceful nuclear activities and of the absence of undeclared nuclear material or activities in that State Party as a whole'.

How a comprehensive nuclear disarmament verification regime might look

The task of preventing re-armament by former nuclear-armed states would be similar to the existing non-proliferation safeguards. It is, therefore, not surprising that the TPNW assigns a central role in maintaining a nuclear-free world for the IAEA. Given the IAEA's robust experience in monitoring and inspections, the organization would, in principle, be capable of performing much of the work required for comprehensive nuclear disarmament verification.

However, verifying compliance with the TPNW would mean a significant expansion of the IAEA's mission. In working towards a nuclear-free world, the scope of the IAEA's activities would be extended and maximum performance in the detection of critical materials and undeclared facilities would be required. The need for timely detection would also be heightened, given the former nuclear-armed states' previous experience on weaponization.

At the same time, the TPNW points to the need for another, yet unidentified international authority to verify the elimination of existing arsenals. This reflects the special challenges related to the secrecy and controversy around nuclear weapons, which the IAEA alone might not be able to address. The new authority would thus be mainly needed to verify the dismantlement of nuclear warheads, as well the elimination or conversion of nuclear-weapon related infrastructure.[2]

[2] Shea, T., *Verifying Nuclear Disarmament* (Routledge: New York, 2018), p. 9-12.

One key task—presumably shared by the new authority and the IAEA—would be controlling fissile materials, including the highly enriched uranium (HEU) and plutonium from dismantled nuclear warheads, as well as the materials in peaceful use. The unsafeguarded production of weapon-usable fissile materials must be capped and, in order to minimize the risk of hidden material, the past production of such materials must be scrutinized. Attention should also be paid to the former weapon designers, whose know-how could facilitate the rebuilding of nuclear arsenals.[3]

In addition to the division of work between the IAEA and the new international verification authority, a comprehensive disarmament verification regime will need to ensure coordination with other relevant institutions and arrangements, notably the proposed fissile material cut-off treaty (FMCT), the Comprehensive Nuclear-Test-Ban Treaty (CTBT) or the Preparatory Commission for the CTBT Organization (CTBTO), and relevant bilateral treaties.

Unresolved political questions

The technical and institutional challenges of establishing a functioning nuclear disarmament verification regime are enormous. However, there is general agreement that the considerable work already done to address them provides a promising basis for building such a regime.

The most crucial challenges are more of a political nature. After all, a nuclear-free world—in which the former nuclear-armed states submit to an intrusive verification regime, trusting both each other and the effectiveness of that regime in detecting cheating—implies a profound transformation towards a more cooperative international society.

It also implies a credible enforcement mechanism. Indeed, the question as to how to respond to violations of the TPNW points to the need to reconsider the privileged role of the five nuclear-armed United Nations Security Council permanent members as the principal enforcers of international norms. This, in turn, suggests a fundamental restructuring of power relations within the UN.

Deep reservations about such far-reaching background assumptions arguably constitute one of the main sources of scepticism towards the TPNW. However, it should be noted that the same assumptions are built into the almost universally accepted goal of the complete elimination of nuclear weapons, also endorsed in Article VI of the NPT.

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[3] Scheffran, J., 'Verification and security in a nuclear-weapon free world: elements and framework of a nuclear weapons convention', UNIDIR Disarmament Forum 2010, p. 54.

Conclusions

Much work has been done in recent years to address the technical challenges related to nuclear disarmament verification. Together with past arms control and non-proliferation verification experience, such work provides a vast pool of knowledge that could be used as the basis of a comprehensive verification system complementing the TPNW. At the same time, much work remains, particularly in terms of operationalizing existing verification solutions and initiatives to serve the common purpose of comprehensive nuclear disarmament.

Regardless of divergent views on the merits of the TPNW, the pace of nuclear disarmament, and the likelihood of achieving the political conditions for a complete abolition of nuclear weapons—the process of developing a comprehensive disarmament regime must be a joint effort by both the nuclear 'haves' and 'have nots'. In this context, clarifying and supplementing the TPNW's verification provisions can help to make the complete elimination of nuclear weapons a more realistic long-term goal.

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(4) Reduction of Nuclear Weapons

A) Reduction of nuclear weapons

New START

Russia and the United States continue to undertake reductions of their strategic nuclear weapons under the New Strategic Arms Reduction Treaty (New START). Since the entry into force of the Treaty in February 2011, neither side has alleged non-compliance.

The status of their strategic (nuclear) delivery vehicles and warheads under the New START has been periodically updated in the U.S. Department of State homepage (see Table 1-4 below). The United States also declared the number of each type of its strategic delivery vehicles (see Table 1-5). According to the data as of February 5, 2018—the deadline for reducing their strategic arsenals under the treaty—the number of Russian and U.S deployed strategic delivery vehicles and deployed/non-deployed strategic delivery vehicles/launchers, besides deployed strategic warheads, fell below the limit. The two countries declared they have met the limits for strategic nuclear forces.[37]

Since the treaty's entry into force, Russia and the United States have implemented the on-site inspections it stipulates. [38] Neither side asserted any non-compliance until 2017. However, in April 2018 Russia criticized that "the United States reached the parameters set by the Treaty not only by actually reducing the arms but also by undertaking manipulations inconsistent with common practice for agreements…[I]t was done through converting a certain number of Trident-II SLBM launchers and B-52H heavy bombers in such a way that precluded the Russian Federation from confirming that these strategic arms had been rendered incapable of employing SLBMs or nuclear armaments for heavy bombers as specified in the Treaty."[39]

U.S. President Donald Trump, inaugurated in January 2017, has been critical of the New START. It was reported that in his first telephone call with Russian President Vladimir Putin in February 2017, President Trump denounced the treaty that caps their deployment of nuclear warheads as a bad deal for the United States.[40] Reacting negatively to Putin's suggestion that the two countries begin work to extend the treaty, Trump said New START "[is] a one-sided deal […and] another bad deal that the

[37] "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, February 22, 2018, https://www.state.gov/t/avc/newstart/278775.htm.

[38] "New START Treaty Inspection Activities," U.S. Department of State, https://www.state.gov/t/avc/newstart/c52405.htm.

[39] Ministry of Foreign Affairs of Russian Federation, "Russia's Assessment of the US Department of State's Report on Adherence to and Compliance with Arms Control, Nonproliferation, and Disarmament Agreements and Commitments," April 24, 2018, http://www.mid.ru/en/foreign_policy/news/-/asset_publisher/cKNonkJE02Bw/content/id/3192916. See also Vladimir Isachenkov, "Russia Challenges US Compliance with Nuclear Arms Treaty," *Associated Press*, September 9, 2018, https://apnews.com/d9eeccab26d64019ab3ea1954eb89280.

[40] Jonathan Landay and David Rohde, "Exclusive: In Call with Putin, Trump Denounced Obama-era Nuclear Arms Treaty – Sources," *Reuters*, February 10, 2017, http://www.reuters.com/article/us-usa-trump-putin-idUSKBN15O2A5.

country made…We're going to start making good deals."[41] However, the United States had not appeared to be seriously contemplating a withdrawal from the treaty as of the end of 2018.

At the U.S.-Russian summit held on July 16, 2018, President Putin proposed a five-year extension of the New START, which is due to expire in 2021. In addition, he reportedly presented President Donald Trump with a series of requests, including new talks on controlling nuclear arms, prohibiting weapons in outer space, and reaffirming commitment to the INF Treaty.[42] However, they could reach no agreement on each issue.[43] U.S. Under Secretary of State Andrea Thompson said in testimony before the Senate Foreign Relations Committee, "Russia continues to violate a series of arms control obligations that undermine the trust the United States can place in treaties, including some that have served U.S. and allied security interests for years."[44]

Reductions of non-strategic nuclear weapons and allegations of non-compliance of the INF Treaty

Russia and the United States have mutually pointed out and criticized the other's allegations of non-compliance with the Intermediate-range Nuclear Forces (INF) Treaty. On October 20, 2018, President Trump announced that he intended to withdraw from the treaty. He said:
Russia has violated the agreement. They've been violating it for many years…We're the ones that have stayed in the agreement, and we've honored the agreement. But Russia has not, unfortunately, honored the agreement. So we're going to terminate the agreement and we're going to pull out…We'll have to develop those weapons – unless Russia comes to us, and China comes to us, and they all come to us and they say, "Let's really get smart and let's none of us develop those weapons." But if Russia is doing it and if China is doing it, and we're adhering to the agreement, that's unacceptable.[45]

On October 22-23, after talks with President Putin and other Russian top officials, Under Secretary of State Bolton told that a U.S. official

[41] Steve Holland, "Trump Wants to Make Sure U.S. Nuclear Arsenal at 'Top of the Pack,'" *Reuters*, February 23, 2017, https://www.reuters.com/article/us-usa-trump-exclusive/trump-wants-to-make-sure-u-s-nuclear-arsenal-at-top-of-the-pack-idUSKBN1622IF.

[42] Bryan Bender, "Leaked Document: Putin Lobbied Trump on Arms Control," *Politico*, August 7, 2018, https://www.politico.com/story/2018/08/07/putin-trump-arms-control-russia-724718.

[43] On the other hand, Russian ambassador to the United States Anatoly Antonov told that "important verbal agreements were reached at the Helsinki summit on arms control issues, including preservation of the New START and INF Treaty." At the Senate Foreign Relations Committee in September, Senator Bob Menendez urged the Trump administration to shed light on what the two leaders discussed and whether there were any agreements." Cristina Maza, "Trump-Putin Summit: What Secret Agreements Did They Make on Arms Control? Senators Ask," *Newsweek*, September 18, 2018, https://www.newsweek.com/trump-putin-summit-what-secret-agreements-did-they-make-arms-control-senators-1126938.

[44] Andrea Thompson, "Statement for the Record," Testimony before the Senate Committee on Foreign Relations, September 18, 2018.

[45] White House "Remarks by President Trump Before Air Force One Departure," October 20, 2018

notification of withdrawal would be filed "in due course." In December, President Trump tweeted: "I am certain that, at some time in the future, President Xi and I, together with President Putin of Russia, will start talking about a meaningful halt to what has become a major and uncontrollable Arms Race. The U.S. spent 716 Billion Dollars this year. Crazy!" Next day, State Secretary Pompeo said, "[T]he United States today declares it has found Russia in material breach of the treaty and will suspend our obligations as a remedy effective in 60 days unless Russia returns to full and verifiable compliance."[46]

The reasons for the U.S. withdrawing from the INF Treaty are Russia's alleged violations of the Treaty, and China's enhancement of intermediate-range missiles (although the latter is not a state party to the INF Treaty). In July 2014 the United States first officially brought up the allegations of Russian non-compliance.

According to the report, titled "Adherence to and Compliance with Arms Control, Nonproliferation, and Disarmament Agreements and Commitments", issued by the U.S. Department of State in April 2018, the United States pointed out the INF Treaty's provisions related to the allegations of Russia's non-compliance.[47] The report also mentioned that the United States had provided Russia: "Information pertaining to the missile and the launcher, including Russia's internal designator for the mobile launcher chassis and the names of the companies involved in developing and producing the missile and launcher; Information on the violating GLCM's test history, including coordinates of the tests and Russia's attempts to obfuscate the nature of the program; …[and the U.S. assessment that] the Russian designator for the system in question is 9M729.[48] According to a news article in February 2017, Russia has two battalions of SCC-8 GLCMs (each battalion equipped with four launchers): one is located at Russia's missile test site at Kapustin Yar in southern Russia near Volgograd; and the other was shifted in December 2016 from that test site to an operational base elsewhere in the country.[49] In March 2018, the commander of U.S. nuclear forces, John Hyten, said that Russia had increased its production and deployment of

[46] Michael R. Pompeo, "Press Availability at NATO Headquarters," Brussels, December 4, 2018, https://www.state.gov/secretary/remarks/2018/12/287873.htm. See also Julian Borger, "US Says it Will Pull Out of INF Treaty if Russia Does Not Comply Within 60 Days," *Guardian*, December 4, 2018, https://www.theguardian.com/world/2018/dec/04/us-inf-russia-nuclear-treaty-deadline.

[47] U.S. Department of State, "Adherence to and Compliance with Arms Control, Nonproliferation, and Disarmament Agreements and Commitments," April 2018, https://www.state.gov/t/avc/rls/rpt/2018/280532.htm. See also *Hiroshima Report 2015* and *Hiroshima Report 2016*.

[48] U.S. Department of State, "Adherence to and Compliance with Arms Control, Nonproliferation, and Disarmament Agreements and Commitments," April 2018, https://www.state.gov/t/avc/rls/rpt/2018/280532.htm.

[49] Michael R. Gordon, "Russia Deploys Missile, Violating Treaty and Challenging Trump," *New York Times*, February 14, 2017, https://www.nytimes.com/2017/02/14/world/europe/russia-cruise-missile-arms-control-treaty.html.

alleged cruise missiles system.[50]

For its part, Russia dismissed the U.S. claims and asserted that it is the United States that has violated the INF Treaty, claiming that:[51]

- U.S. tests of target-missiles for missile defense have similar characteristics to intermediate-range missiles;
- U.S. production of armed drones falls within the definition of ground-launched cruise missiles in the Treaty; and
- The Mk-41 launch system, which the United States intends to deploy in Poland and Romania in accordance with the European Phased Adaptive Approach of the BMD, can also launch intermediate-range cruise missiles.

After the U.S. announcement of withdrawal from the INF Treaty, Moscow repeatedly warned it would develop land-based intermediate-range missiles as a countermeasure if Washington actually withdrew.

The United States has denied the Russian arguments about U.S. violations of the INF Treaty, and contemplated both diplomatic and defensive countermeasures.[52] In its 2018 Nuclear Posture Review (NPR), the United States devised plans to develop nuclear SLCMs as well as low-yield nuclear warheads for SLBMs. According to the report, "SLCM will provide a needed non-strategic regional presence, an assured response capability, and an INF-Treaty compliant response to Russia's continuing Treaty violation. If Russia returns to compliance with its arms control obligations, reduces its non-strategic nuclear arsenal, and corrects its other destabilizing behaviors, the United States may reconsider the pursuit of a SLCM."[53]

Russia submitted a draft resolution to the First Committee of the UNGA in 2018, titled "Preservation of and compliance with the Intermediate-Range Nuclear Forces Treaty." The resolution was not adopted on December 21. The voting result was: 43 in favor, 46 Against (Australia, Belgium, Canada, France, Germany, Israel, Japan, South Korea, the Netherlands, New Zealand, Norway, Poland, Saudi Arabia, Sweden, Turkey, the U.K., the U.S. and others), and 78 Abstentions (India, Switzerland and others). Prior to the vote, the United States said that it would vote against the text because it is disingenuous for the Russian Federation, as it is in breach of the INF, to put forward a resolution

[50] "U.S. Says Russia Deployment Of 'Banned' Cruise Missile Increasing," *Radio Free Europe*, March 20, 2018, https://www.rferl.org/a/united-states-russia-increasing-deployment-of-banned-cruise-missile/29111751.html.

[51] Ministry of Foreign Affairs of Russian Federation, "Russia's Assessment of the US Department of State's Report on Adherence to and Compliance with Arms Control, Nonproliferation, and Disarmament Agreements and Commitments," April 24, 2018, http://www.mid.ru/en/foreign_policy/news/-/asset_publisher/cKNonkJE02Bw/content/id/3192916.

[52] See *Hiroshima Report 2018*.

[53] U.S. Department of Defense, *Nuclear Posture Review*, February 2018, p. 55.

on the Treaty it is violating.[54]

Other Nuclear-Weapon/Armed States

Among nuclear-armed states other than Russia and the United States, France and the United Kingdom have reduced their nuclear weapons unilaterally. The United Kingdom, which previously announced plans to reduce its nuclear forces to no more than 120 operationally available warheads and a total stockpile of no more than 180 warheads by the mid 2020s, declared in January 2015 that it had completed the reduction of the number of deployed warheads on each of its Nuclear-Powered Ballistic Missile Submarine (SSBN) from 48 to 40 as committed to in 2010, and the total number of operationally available warheads has therefore been reduced to 120.[55]

Among the five NWS, China has neither declared any concrete information on the number of deployed or possessed nuclear weapons, nor any plan for their reduction, while reiterating that it keeps its nuclear arsenal at the minimum level required for its national security. It is widely estimated that China has not dramatically increased its nuclear arsenal numerically, perhaps keeping increases in warhead numbers to about 10 annually. On the other hand, it is likely that China will continue qualitative advancements in its nuclear arsenal.

As for India, Pakistan, Israel and North Korea, there is no information, statement or analysis which suggests any reduction of their nuclear weapons or capabilities. To the contrary, as noted below, they are expanding their nuclear programs.

[54] "General Assembly Rejects Resolution Calling for Strengthening Russian-United States Compliance with Intermediate-Range Nuclear Forces Treaty," United Nations Meetings Coverage, December 21, 2018, https://www.un.org/press/en/2018/ga12116.doc.htm.

[55] "UK Downsizes Its Nuclear Arsenal," *Arms Control Today*, Vol. 45, No. 2 (March 2015), http://www.armscontrol.org/ACT/2015_03/News-Brief/UK-Downsizes-Its-Nuclear-Arsenal.

Table 1-4: Russian and U.S. strategic (nuclear) delivery vehicles and warheads under the New START

	U.S.			Russia		
	Deployed strategic (nuclear) warheads	Deployed strategic (nuclear) vehicles	Deployed/non-deployed strategic delivery vehicles/launchers	Deployed strategic (nuclear) warheads	Deployed strategic (nuclear) vehicles	Deployed/non-deployed strategic delivery vehicles/launchers
Aggregate limits	1,550	700	800	1,550	700	800
Feb. 2011	1,800	882	1,124	1,537	521	865
Sep. 2011	1,790	822	1,043	1,566	516	871
Mar. 2012	1,737	812	1,040	1,492	494	881
Sep. 2012	1,722	806	1,034	1,499	491	884
Mar. 2013	1,654	792	1,028	1,480	492	900
Sep. 2013	1,688	809	1,015	1,400	473	894
Mar. 2014	1,585	778	952	1,512	498	906
Sep. 2014	1,642	794	912	1,643	528	911
Mar. 2015	1,597	785	898	1,582	515	890
Sep. 2015	1,538	762	898	1,648	526	877
Mar. 2016	1,481	741	878	1,735	521	856
Sep. 2016	1,367	681	848	1,796	508	847
Mar. 2017	1,411	673	820	1,765	523	816
Sep. 2017	1,393	660	800	1,561	501	790
Feb. 2018	1,350	652	800	1,444	527	779
Sep. 2018	1,398	659	800	1,420	517	775

Due to the Treaty's counting rules, the number of warheads cited above does not accurately reflect the actual situation of nuclear forces in both countries. The New START Treaty counts a heavy bomber as one delivery system and one nuclear warhead, despite the fact that the bombers can actually load 6-20 warheads. Also, according to its counting rule stipulated in the Treaty, for ICBMs and SLBMs, the number of warheads shall be the number of reentry vehicles emplaced on deployed ICBMs and on deployed SLBMs.

Sources: U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, October 25, 2011, https://2009-2017.state.gov/t/avc/rls/176096.htm; U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, April 6, 2012, https://2009-2017.state.gov/t/avc/rls/178058.htm; U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, October 3, 2012, https://2009-2017.state.gov/t/avc/rls/198582.htm; U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, April 3, 2013, https://2009-2017.state.gov/t/avc/rls/207020.htm; U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, October 1, 2013, https://2009-2017.state.gov/t/avc/rls/215000.htm; U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, April 1, 2014, https://2009-2017.state.gov/t/avc/rls/224236.htm; U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, October 1, 2014, https://2009-2017.state.gov/t/avc/rls/232359.htm; U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, July 1, 2015, https://2009-2017.state.gov/t/avc/rls/240062.htm; U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, October 1, 2015, https://2009-2017.state.gov/t/avc/rls/247674.htm; U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, October 1, 2016, https://2009-2017.state.gov/t/avc/rls/2016/262624.htm; U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, January 1, 2017, https://2009-2017.state.gov/t/avc/rls/2016/266384.htm; U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, July 1, 2017, https://www.state.gov/t/avc/newstart/272337.htm; U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, February 22, 2018, https://www.state.gov/t/avc/newstart/278775.htm; U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, September 1, 2018, https://www.state.gov/t/avc/newstart/286466.htm.

Table 1-5: U.S. strategic (nuclear) delivery vehicles

ICBMs and ICBM Launchers		Deployed ICBM	Non-deployed ICBM	Deployed and Non-deployed Launchers of ICBMs	Deployed launchers of ICBMs	Non-deployed launchers of ICBMs	Test Launchers
Sep. 2012	MM-III	449	263	506	449	57	6
	PK	0	58	51	0	51	1
	Total	449	321	557	449	108	7
Mar. 2013	MM-III	449	256	506	449	57	6
	PK	0	58	51	0	51	1
	Total	449	314	557	449	108	7
Sep. 2013	MM-III	448	256	506	448	58	6
	PK	0	57	51	0	51	1
	Total	448	313	557	448	109	7
Mar. 2014	MM-III	449	250	506	449	57	6
	PK	0	56	1	0	1	1
	Total	449	306	507	449	58	7
Sep. 2014	MM-III	447	251	466	447	19	6
	PK	0	56	1	0	1	1
	Total	447	307	467	447	20	7
Mar. 2015	MM-III	449	246	454	449	5	4
	Total	449	246	454	449	5	4
Sep. 2015	MM-III	441	249	454	441	13	4
	Total	441	249	454	441	13	4
Mar. 2016	MM-III	431	225	454	431	23	4
	PK	n/a	n/a	n/a	n/a	n/a	n/a
	Total	431	225	454	431	23	4
Sep. 2016	MM-III	416	270	454	416	38	4
	PK	n/a	n/a	n/a	n/a	n/a	n/a
	Total	416	270	454	416	38	4
Mar. 2017	MM-III	405	278	454	405	49	4
	Total	405	278	454	405	49	4
Sep. 2017	MM-III	399	281	454	399	55	4
	Total	399	281	454	399	55	4
Feb. 2018	MM-III	400	278	454	400	54	4
	Total	400	278	454	400	54	4

MM-III: Minuteman III PK: Peacekeeper

SLBMs and SLBM Launchers		Deployed SLBMs	Non-deployed SLBMs	Deployed and Non-deployed Launchers of SLBMs	Deployed launchers of SLBMs	Non-deployed launchers of SLBMs	Test Launchers
Sep. 2012	Trident II	239	180	336	239	97	0
	Total	239	180	336	239	97	0
Mar. 2013	Trident II	232	176	336	232	104	0
	Total	232	176	336	232	104	0
Sep. 2013	Trident II	260	147	336	260	76	0
	Total	260	147	336	260	76	0
Mar. 2014	Trident II	240	168	336	240	96	0
	Total	240	168	336	240	96	0
Sep. 2014	Trident II	260	151	336	260	76	0
	Total	260	151	336	260	76	0
Mar. 2015	Trident II	248	160	336	248	88	0
	Total	248	160	336	248	88	0
Sep. 2015	Trident II	236	190	336	236	100	0
	Total	236	190	336	236	100	0
Mar. 2016	Trident II	230	199	324	230	94	0
	Total	230	199	324	230	94	0
Sep. 2016	Trident II	209	210	320	209	111	0
	Total	209	210	320	209	111	0
Mar. 2017	Trident II	220	203	300	220	80	0
	Total	220	203	300	220	80	0
Sep. 2017	Trident II	212	215	280	212	68	0
	Total	212	215	280	212	68	0
Feb. 2018	Trident II	203	231	280	203	77	0
	Total	203	231	280	203	77	0

Heavy Bombers		Deployed Heavy Bombers	Non-deployed Heavy Bombers	Test Heavy Bombers	Heavy Bombers Equipped for Non-nuclear Armament
Sep. 2012	B-2A	10	10	1	0
	B-52G	30	0	0	0
	B-52H	78	13	2	0
	Total	118	23	3	0
Mar. 2013	B-2A	10	10	1	0
	B-52G	24	0	0	0
	B-52H	77	14	2	0
	Total	111	24	3	0
Sep. 2013	B-2A	11	9	1	0
	B-52G	12	0	0	0
	B-52H	78	12	2	0
	Total	101	21	3	0
Mar. 2014	B-2A	11	9	1	0
	B-52H	78	11	2	0
	Total	89	20	3	0
Sep. 2014	B-2A	10	10	1	0
	B-52H	77	12	2	0
	Total	87	22	3	0
Mar. 2015	B-2A	12	8	1	0
	B-52H	76	12	3	0
	Total	88	20	4	0
Sep. 2015	B-2A	12	8	1	0
	B-52H	73	15	2	0
	Total	85	23	3	0
Mar. 2016	B-2A	12	8	1	0
	B-52H	68	12	2	8
	Total	80	20	3	8
Sep. 2016	B-2A	10	10	1	0
	B-52H	46	8	2	33
	Total	56	18	3	33
Mar. 2017	B-2A	12	8	1	0
	B-52H	36	10	2	41
	Total	48	18	3	41
Sep. 2017	B-2A	11	9	1	0
	B-52H	38	8	2	41
	Total	49	17	3	41
Feb. 2018	B-2A	13	7	1	0
	B-52H	36	10	2	41
	Total	49	17	3	41

Sources: U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, November 30, 2012, http:// 2009-2017.state.gov/t/avc/rls/201216.htm; U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, July 1, 2013, http:// http:// 2009-2017.state.gov/t/avc/rls/201216.htm; U.S. Department of State.state.gov/t/avc/rls/211454.htm; U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, January 1, 2014, http:// http:// 2009-2017. state.gov/t/avc/rls/201216.htm; U.S. Department of State.state.gov/t/avc/rls/21922.htm; U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, July 1, 2014, http:// http:// 2009-2017.state.gov/t/avc/rls/201216.htm; U.S. Department of State.state.gov/t/avc/rls/228652.htm; U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, October 1, 2016, https://2009-2017.state.gov/t/avc/rls/2016/262624.htm; U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, January 1, 2017, https://2009-2017.state.gov/t/avc/rls/2016/266384.htm; U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, July 1, 2017, https://www.state.gov/t/avc/newstart/272337.htm; U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, January 12, 2018, https://www.state.gov/t/ avc/newstart/277439.htm; U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, July 6, 2018, https://www.state.gov/t/avc/newstart/284121.htm.

Column 3

A Possible Demise of the INF Treaty and Japan's Security

Masahiko Asada

It is not too much to say that "shocking" decisions by President Donald J. Trump are no longer unusual. Seen from this standpoint, the statement of his intention to withdraw from the INF Treaty may not be so "shocking." Still, the developing news over the withdrawal from the Treaty, a symbol of the end of the long-lasting Cold War, has come as a shock to quite a few people. Soon after the statement by President Trump, National Security Advisor John R. Bolton in October 2018 visited Russia to deliver the U.S. policy of withdrawal from the INF Treaty, accusing Russia of noncompliance with it. Then in December, it was reported that Secretary of State Mike Pompeo had given Russia an "ultimatum" on the Treaty: that the United States would "suspend [its] obligations as a remedy effective in 60 days unless Russia returns to full and verifiable compliance." Numerous experts are concerned that such a U.S. policy would "run counter to disarmament processes." However, things are not so simple.

The INF Treaty, signed by the United States and the Soviet Union in December 1987, obliges both parties to eliminate land-based ballistic and cruise missiles with ranges of 500 to 5,500 kilometers. The Treaty entered into force in June 1988, and the elimination of those missiles was completed in May 1991. Being a U.S.-Soviet bilateral treaty, its main arena of application was the European theater.

In the 1970s, the Soviet Union started to deploy the SS-20 intermediate-range ballistic missiles (IRBMs). The deployment of these nuclear missiles, which "can reach Europe but not the United States," raised the fear among European States over the credibility of the U.S. extended deterrence, or a decoupling of the transatlantic alliance. In other words, the European NATO countries were concerned about the uncertainty over whether the United States would retaliate

on the Soviet Union with nuclear weapons, with the risk to be struck by them, when Europe received Soviet limited nuclear attacks with SS-20s. To respond to the deployment of the SS-20s, the NATO adopted the "Double-Track Decision" in December 1979: that is, that NATO offered the Soviet Union a commencement of negotiations on mutual disarmament of the INF, but that the United States would deploy Pershing II IRBMs and ground launched cruise missiles (GLCMs) in Western Europe if Moscow rejected NATO's offer. The Soviet Union in the end accepted to hold negotiations, resulting in the conclusion of the INF Treaty.

In this connection, it is the relation between the INF Treaty and Japan that we should never forget. During the U.S.-Soviet negotiations, the Japanese government was concerned that they would conclude a regional treaty which covered their INF only in the European theater, and that the INF deployed there would be moved to the Asia region. Therefore, Tokyo urged Washington to pursue a so-called "global zero option," that is, the global elimination of the U.S./Soviet INF. Japan played a crucial role in their establishment of the existing INF Treaty.

The situation surrounding the INF today is completely different from the one in the 1970s-80s, especially in Asia. As the result of the proliferation of missile technologies after the Cold War, many States in this region, including North Korea, South Korea, India, Pakistan, Iran and Syria have acquired intermediate-range missiles, let alone China, which allegedly has hundreds of the INF.

The real reason behind the U.S. intention of withdrawing from the INF Treaty undoubtedly concerns China's INF, although Washington officially has explained it on the grounds of Russia's non-compliance. Russia also should have concerns over China. That is why Moscow has urged China to join in a new framework of nuclear arms control that will take the place of the INF Treaty.

Since disarmament and security are intertwined with each other, it is essential to approach disarmament issues with multi-faceted thinking. Being strongly aware of the INF Treaty negotiations in the 1980s, it should not be forgotten that disarmament talks between nuclear powers may well be directly linked to Japanese security. This certainly applies to the denuclearization talks between the United States and the DPRK.

Postscript:

On 2 February 2019, the United States government provided Russia and other Treaty Parties (some of the former Soviet republics) with formal notice that the United States will withdraw from the INF Treaty in six months, pursuant to Article XV of the Treaty.

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B) A concrete plan for further reduction of nuclear weapons

In 2018, there were no new proposals by nuclear-armed states to take new, concrete measures for further reductions of their nuclear arsenals. As mentioned above, there was little progress on U.S.-Russian further reductions of their strategic and non-strategic nuclear forces. Russia has insisted that the rest of the nuclear-armed states should participate in any future nuclear weapons reductions

However, China, France and the United Kingdom have not changed their positions that further significant reduction of Russian and U.S. nuclear arsenals is needed, so as to commence a multilateral process of nuclear weapons reductions. For instance, China argued that "[c]ountries possessing the largest nuclear arsenals bear special and primary responsibility for nuclear disarmament and should take the lead in substantially reducing those arsenals in a verifiable, irreversible and legally binding manner, thus creating the conditions necessary for the ultimate goal of general and comprehensive nuclear disarmament. When conditions are ripe, other nuclear-weapon States should also join the multilateral negotiations on nuclear disarmament."[56] However, it has not mentioned the extent of reductions in U.S. and Russian nuclear weapons, by which China would then participate in a process of multilateral nuclear weapons reduction. Regarding this point, France clearly stated in February 2015: "If the level of the other arsenals, particularly those of Russia and the United States, were to fall one day to a few hundred weapons, France would respond accordingly, as it always has."[57]

As mentioned below, North Korea pledged "denuclearization of the Korean Peninsula," but has not presented a concrete plan on dismantling its nuclear arsenals.

C) Trends on strengthening/ modernizing nuclear weapons capabilities

While nuclear-armed states have reiterated their commitments to promoting nuclear disarmament, they continue to modernize and/or strengthen their nuclear weapons capabilities.

China

It is believed that China is actively modernizing its nuclear forces, details and numbers of which have never been declassified.

In its Annual Report on the Chinese Military in 2018, the U.S. Department of Defense reported that China is estimated to possess approximately 75-100 Intercontinental Ballistic Missiles (ICBMs)—DF-5A, DF-5B (with multiple independently targetable reentry vehicles (MIRV), DF-31/31A and DF-4. In the maritime realm, China has four operational JIN-class SSBN (Type 094) armed with JL-2 SLBMs, and a

[56] NPT/CONF.2020/PC.II/WP.32, April 19, 2018.

[57] "Statement by France," General Debate, First Session of the Preparatory Committee for the 2020 NPT Review Conference, May 3, 2017.

planned next generation Type 096 SSBN armed with a follow-on JL-3 SLBM will likely begin construction in the early-2020s.[58] In November 2018, China reportedly conducted a flight test of the JL-3.[59] The United States also estimates that China is developing a stealth strategic bomber expecting to have a nuclear mission.[60]

Regarding new developments in China's nuclear forces, for example, Chinese Defense Ministry spokesman Wu Qian told reporters in April that China had deployed its first intermediate-range ballistic missile, the DF-26, which was capable of lofting both conventional and nuclear warheads.[61] It was also reported that China had tested an air-launched ballistic missile—no other country has deployed this missile type—five times between 2016 and January 2018.[62] A prototype of China's new strategic bomber named Hong-20 is expected to make its first flight test in the near future.[63] China is also aggressively developing a hypersonic flight vehicle. In August 2018, the China Academy of Aerospace Aerodynamics, under the China Aerospace Science and Technology Corporation, announced it has successfully tested its first waverider hypersonic flight vehicle, the Xingkong-2 (or Starry Sky-2), which reached 30 kilometers in altitude at Mach 5.5-6.[64]

France

In 2018 no significant movement was reported regarding nuclear modernization by France. It introduced new M-51 SLBMs in 2010, with an estimated range of 8,000 km. They were loaded in the fourth Le Triomphant-class SSBN. The previous three Le Triomphant-class SSBNs remain equipped with M-45 SLBMs that have a range of 6,000km. France plans to replace those M-45s with M-51s by 2017-2018.[65]

In a speech on nuclear policies in February 2015, President François Hollande announced France would replace the last remaining Mirage 2000N fighters with Rafales, carrying the ASMPA (improved air-to-ground medium-range missile system), by 2018. He said he had instructed the Atomic Energy Commission to prepare the necessary adaptations of its nuclear

[58] U.S. Department of Defense, *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2018*, May 2018, pp. 29, 36-37.

[59] Bill Gertz, "China Flight Tests New Submarine-Launched Missile," *Washington Free Beacon*, December 18, 2018, https://freebeacon.com/national-security/china-flight-tests-new-submarine-launched-missile/.

[60] U.S. Department of Defense, *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2018*, p. 34.

[61] "China Deploy Advanced DF-26 Missile," *Associated Press*, April 26, 2018, https://www.defensenews.com/global/asia-pacific/2018/04/26/china-deploys-advanced-df-26-missile/.

[62] Alicia Sanders-Zakre, "China Develops, Deploys New Missiles," *Arms Control Today*, June 1, 2018, https://www.armscontrol.org/act/2018-06/news-briefs/china-develops-deploys-new-missiles.

[63] Mike Yeo, "In first, China Confirms 'New Long-Range Strategic Bomber' Designation," *Defense News*, October 11, 2018, https://www.defensenews.com/air/2018/10/11/in-first-china-confirms-new-long-range-strategic-bomber-designation/.

[64] Liu Xuanzun, "China Tests Hypersonic Aircraft That Can 'Break Any Missile Defense System,'" *Global Times*, August 5, 2018, http://www.globaltimes.cn/content/1113980.shtml.

[65] See, for example, "France Submarine Capabilities," Nuclear Threat Initiative, August 15, 2013, http://www.nti.org/analysis/ articles/france-submarine-capabilities/.

warheads ahead of the end of their operational life, without nuclear testing; and he underlined France's commitment not to produce new types of nuclear weapon. He also declassified in this speech that the French nuclear deterrent consists of 54 middle-range ALCMs and three sets of 16 SLBMs.[66]

Russia

Russia continued to develop new types of strategic nuclear forces to replace its aging systems. In August 2018, Russia's Minister of Defense Sergei Shoigu announced that 90 percent of Russia's strategic nuclear forces will be armed with modern weaponry by 2021, and over 60 percent of the Strategic Missile Forces will be armed with new weapon systems by late 2020.[67] President Putin also asserted in his address in March that Russian nuclear forces, including strategic nuclear weapons, nuclear-propulsion cruise missiles and hypersonic weapons, have achieved significant technological developments.[68]

The following are Russia's development and deployment of strategic nuclear forces reported in 2018:

- ICBMs—The focus of the current phase of Russia's modernization is the MIRVed ICBM RS-24 or Yars, which is a modified SS-27 Mod 1 (Topol-M). President Putin said that 14 missile regiments will receive new Yars systems to replace their old Topol systems.[69] Russia is also developing an RS-28 ICBM that can carry 10 warheads per missile, for replacing SS-18 heavy ICBMs.[70]
- SSBNs/SLBMs—A new Borei A-class SSBN will be operated by 2025, which can launch 20 Bulava SLBMs. The Bulava is capable of carrying up to 10 nuclear and hypersonic weapons.[71] Development of the Borei-A SSBN and deployment of the fourth Borei-class SSBN has been delayed,[72] but in September 2018 it was reported that the Borei-A SSBN will be deployed in 2024.[73]
- Strategic Bombers—The Tu-22M3M,

[66] François Hollande, "Nuclear Deterrence—Visit to the Strategic Air Forces," February 19, 2015, http://basedoc.diplomatie.gouv.fr/vues/Kiosque/FranceDiplomatie/kiosque.php?fichier=baen2015-02-23.html#Chapitre1.

[67] "Defense Chief Sets Sights on Beefing Up Russia's Nuclear Triad with Advanced Weaponry," *Tass*, January 10, 2018, http://tass.com/defense/984435.

[68] "Presidential Address to the Federal Assembly," March 1, 2018, http://en.kremlin.ru/events/president/news/56957.

[69] "Putin Says New Russian Missiles, Bombers to Be Deployed This Year," *Radio Free Europe*, May 16, 2018, https://www.rferl.org/a/putin-says-modernized-russia-missiles-bombers-deploy-this-year-sochi-yars-icbm/29229178.html.

[70] Hans M. Kristensen and Robert S. Norris, "Russian Nuclear Forces, 2018," *Bulletin of the Atomic Scientists*, Vol. 74, No. 3 (2018), p. 189.

[71] Amanda Macias, "Russian Submarine Fleet Capable of Launching Missiles Armed with Hypersonics and Nukes Will be Ready for War by 2024," *CNBC*, September 21, 2018, https://www.cnbc.com/2018/09/21/russia-sub-fleet-capable-of-launching-hypersonics-will-be-ready-by-2024.html.

[72] Kristensen and Norris, "Russian Nuclear Forces, 2018," p. 190.

[73] Macias, "Russian Submarine Fleet Capable of Launching Missiles."

a modernized version of the Tu-22M, was reported to have been delivered to the Russian Air Forces. This bomber is expected to carry anti-ship missiles, including KH-32 with a range of 990 km.[74]

Looking ahead, attention is focused on the Avangard hypersonic boost glide weapon. Following the success of the launch test on December 26, 2018, President Putin said that it would enter service in 2019.[75] The Avangard, with range of at least 5,500 km or more, flies at Mach 20 and has high mobility, so it would be difficult to intercept by ballistic missile defense.

It has also been a concern that Russia continues to develop the Status-6, a nuclear-powered torpedo with very long range of more than 10,000 km,[76] which is designed to destroy coastal locations such as ports, cities, and economic infrastructure. The resulting explosion would create tsunamis of radioactive water and debris, carrying the devastation farther inland and rendering large areas unlivable for generations.[77] On the other hand, the nuclear-propulsion cruise missiles appear to be facing developmental difficulties.[78]

The United Kingdom

In October 2017, the United Kingdom started to construct a new Dreadnought-class of four SSBNs as replacements of the existing Vanguard-class SSBNs, at a projected cost of £31 billion (with additional £10 billion contingency). The first new SSBN is expected to enter into service in the early 2030s. In parallel, the United Kingdom is participating in the U.S. current service-life extension program for the Trident II D5 missile. It is reported that a U.K. decision on a replacement warhead has been deferred until 2019/2020.[79]

The United States

Since the timing of renewal of the U.S. strategic delivery vehicles, which began deployment during the Cold War, is coming closer, the United States has contemplated development of succeeding ICBMs, SSBNs and strategic bombers (and Long Range Stand-Off Weapons

[74] Alex Lockie, "Russia Upgraded a Nuclear Bomber — and Its Missiles are a Nightmare for US Navy Aircraft Carriers," *Business Insider*, August 7, 2018, https://www.businessinsider.com/russias-upgraded-tu-22m3m-has-missile-made-for-us-navy-carriers-2018-8.

[75] "Russia Tests Avangard Hypersonic System on Putin's Orders," *Tass*, December 26, 2018, http://tass.com/defense/1037974.

[76] "Is Russia Working on a Massive Dirty Bomb," Russian *Strategic Nuclear Forces*, November 10, 2015, http://russianforces.org/blog/2015/11/is_russia_working_on_a_massive.shtm.

[77] Kyle Mizokami, "How Can We Stop Russia's Apocalypse Nuke Torpedo?" *National Interest*, August 17, 2018, https://www.popularmechanics.com/military/weapons/a22749605/how-can-we-stop-russias-apocalypse-nuke-torpedo/.

[78] "Russia's Nuclear Cruise Missile Is Struggling to Take Off, Imagery Suggests," *NPR*, September 25, 2018, https://www.npr.org/2018/09/25/649646815/russias-nuclear-cruise-missile-is-struggling-to-take-off-imagery-suggests.

[79] Claire Mills and Noel Dempsey, "Replacing the UK's nuclear deterrent: Progress of the Dreadnought class," UK Parliament, House of Commons Briefing Paper, June 19, 2017.

(LRSO) for use thereon).[80] In addition, with heightening U.S. threat perceptions vis-à-vis, among others, North Korea and Russia, interest in non-strategic nuclear forces has also been increasing both inside and outside of the U.S. administration.

In the NPR publicized in February 2018, the Trump administration reaffirmed the importance of the U.S. nuclear triad and its modernization plan designed by the previous administration as follows:[81]

- Constructing 12 Colombia-class SSBNs, the first of which will start to operate in 2031;
- Building 400 GBSD (new ICBMs) for replacing 450 Minuteman III; and
- Developing and deploying B-21 next generation strategic bombers as well as LRSO.

Regarding non-strategic nuclear forces, the NPR 2018 states that: the United States will maintain, and enhance as necessary, the capability to forward deploy nuclear bombers and DCA around the world; and, in the near-term, the United States will modify a small number of existing SLBM warheads to provide a low-yield option, and in the longer term, pursue a modern nuclear-armed sea-launched cruise missile (SLCM).[82] In September, a group of Democratic members of Congress introduced a bill that would ban the Trump administration's plans for a so-called low-yield nuclear weapon.[83] A month earlier, the Congress had approved a budget for the new nuclear capability by an overwhelming majority.[84]

India

India seems to be energetically pursuing the possession of a strategic nuclear triad, that is: ICBMs and SLBMs to complement its nuclear bomber force. In January, May and December 2018, India conducted flight-tests of Agni-5 mobile ICBMs.[85] It has also developed an Agni-6 ICBM with a range of 8,000-10,000 km. In the maritime realm, India's second strategic nuclear submarine Aridhant was launched in November 2017. India also mentioned in November 2018 that its first domestically built

[80] Regarding the U.S. nuclear modernization program, see, for instance, Amy F. Woolf, "U.S. Strategic Nuclear Forces: Background, Developments, and Issues," *CRS Report*, March 6, 2018, pp. 9-41; "U.S. Nuclear Modernization Program," Fact Sheet and Brief, Arms Control Association, December 2016, https://www.armscontrol.org/factsheets/USNuclearModernization.

[81] NPR 2018, pp. 48-51.

[82] Ibid., pp. 54-55.

[83] Rebecca Kheel, "Dems Introduce Bill to Ban Low-Yield Nukes," *Hill*, September 18, 2018, https://thehill.com/policy/defense/407263-dems-introduce-bill-to-ban-low-yield-nukes.

[84] Travis J. Tritten, "Congress Funds Pentagon's New Low-Yield Nuclear Warhead," *Washington Examiner*, September 13, 2018, https://www.washingtonexaminer.com/policy/defense-national-security/congress-funds-pentagons-new-low-yield-nuclear-warhead.

[85] Dinakar Peri, "India Successfully Test-Fires Nuclear-Capable Agni-5," *The Hindu,* June 4, 2018, http://www.thehindu.com/news/national/india-successfully-test-fires-nuclear-capable-agni-5/article24071775.ece; "India Successfully Test-Fires Nuclear-Capable Agni-5 Missile," *The Times of India*, December 10, 2018, https://timesofindia.indiatimes.com/india/india-successfully-test-fires-nuclear-capable-agni-5-missile/articleshow/67025807.cms.

nuclear-powered submarine had completed a "deterrence patrol."[86] It reportedly plans to build a bigger and more potent version of the indigenous nuclear submarine in the immediate future,[87] and new SLBMs of K-15 (700 km) and K-4 (3,000km).

Israel

It is unclear whether the Israeli Jericho III IRBM remains under development or is already deployed. Along with the land- and air-based components of its nuclear deterrent, Israel is also believed to have deployed a nuclear-capable SLCM. It has signed a memorandum of understanding (MoU) relating to the purchase of three additional Dolphin-class submarines from Germany, which are capable to load the SLCM mentioned above.[88]

Pakistan

Pakistan[89] has prioritized development and deployment of nuclear-capable short- and medium-range missiles for ensuring deterrence vis-à-vis India. Pakistan, for instance, conducted flight tests of Babur-3 SLCM in March[90] and Babur GLCM in April 2018, respectively.[91]

U.S. Director of National Intelligence Dan Coats testified at a February 2018 hearing of the Senate Select Committee on Intelligence that: "Pakistan continues to produce nuclear weapons and develop new types of nuclear weapons, including short-range tactical weapons, sea-based cruise missiles, air-launched cruise missiles, and longer-range ballistic missiles. These new types of nuclear weapons will introduce new risks for escalation dynamics and security in the region.[92]

North Korea

North Korea aggressively developed nuclear weapons and ballistic missiles until 2017. However, it initiated a peace offensive in 2018, and did not conduct any nuclear explosive or

[86] "India Says Nuclear Submarine Makes First Patrol, Modi Warns Against 'Misadventure'," *Reuters*, November 5, 2018, https://www.reuters.com/article/us-india-submarine/india-says-nuclear-submarine-makes-first-patrol-modi-warns-against-misadventure-idUSKCN1NA1HK.

[87] Franz-Stefan Gady, "India Launches Second Ballistic Missile Sub," *Diplomat*, December 13, 2017, https://thediplomat.com/2017/12/india-launches-second-ballistic-missile-sub/; Dinakar Peri and Josy Joseph, "A Bigger Nuclear Submarine is Coming," *The Hindu*, October 15, 2017, http://www.thehindu.com/news/national/a-bigger-nuclear-submarine-is-coming/article19862549.ece.

[88] "Israel Signs MoU to Purchase Dolphin-class Submarines from Germany," *Naval Technology*, October 25, 2017, https://www.naval-technology.com/news/newsisrael-signs-mou-to-purchase-dolphin-class-submarines-from-germany-5956187/.

[89] On Pakistan's nuclear forces, see Hans M. Kristensen, Robert S. Norris & Julia Diamond, "Pakistani Nuclear Forces, 2018," *Bulletin of the Atomic Scientists*, Vol. 74, No. 5 (2018), pp. 348-358.

[90] Ankit Panda, Pakistan Conducts Second Test of Babur-3 Nuclear-Capable Submarine-Launched Cruise Missile," *Diplomat*, April 16, 2018, https://thediplomat.com/2018/04/pakistan-conducts-second-test-of-babur-3-nuclear-capable-submarine-launched-cruise-missile/.

[91] Ankit Panda, "Pakistan Tests Enhanced-Range Variant of Babur Nuclear-Capable Land-Attack Cruise Missile," *Diplomat*, April 16, 2018, https://thediplomat.com/2018/04/pakistan-tests-enhanced-range-variant-of-babur-nuclear-capable-land-attack-cruise-missile/.

[92] Daniel R. Coats, Director of National Intelligence "Worldwide Threat Assessment of the Us Intelligence Community," February 13, 2018.

missile flight tests throughout the year.

Still, North Korea did not seem to completely freeze its nuclear and missile activities. In July 2018, U.S. State Secretary Pompeo testified at the Senate Foreign Relations Committee that North Korea was still producing fissile material for nuclear bombs despite its pledge to denuclearize.[93] In addition to plutonium production and uranium enrichment at the Yongbyon nuclear complex, is it assumed that North Korea operates at least one or two clandestine uranium enrichment facilities elsewhere. Reports in mid-2018 alleged that one such facility is located at a site called Kangson, in the city of Chollima, a short distance southeast of Pyongyang.[94]

Regarding ballistic missile development, it was reported in 2018 that North Korea: continued to operate a key facility to produce solid-rocket motors for missiles for at least the past eight years;[95] expanded a factory complex that produces key engines for solid-fuel ballistic missiles;[96] was constructing at least one and possibly two liquid-fueled ICBMs at a large research facility in Sanumdong, on the outskirts of Pyongyang;[97] and expanded its ICBM base in December.[98] In November 2018, a U.S. think tank published a report identifying 13 secret North Korean missile bases.[99]

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[93] Hearing, Senate Foreign Relations Committee, July 25, 2018, https://www.foreign.senate.gov/hearings/an-update-on-american-diplomacy-to-advance-our-national-security-strategy-072518.

[94] Joby Warrick and Souad Mekhennet, "Summit Collapse Foils Chance to Press North Korea on Suspicious Sites," *Washington Post*, May 25, 2018, https://www.washingtonpost.com/world/national-security/summit-collapse-foils-chance-to-press-north-korea-on-suspicious-sites/2018/05/25/d5a14044-602d-11e8-9ee3-49d6d4814c4c_story.html; Ankit Panda, "Revealing Kangson, North Korea's First Covert Uranium Enrichment Site," *Diplomat*, July 13, 2018, https://thediplomat.com/2018/07/exclusive-revealing-kangson-north-koreas-first-covert-uranium-enrichment-site/.

[95] Joseph S. Bermudez Jr. and Dan Dueweke, "Expansion of North Korea's Solid Fuel Ballistic Missile Program: The Eight Year Old Case of the Chemical Materials Institute," *38 North*, July 25, 2018, https://www.38north.org/2018/07/cmi072518/.

[96] Jonathan Cheng, "North Korea Expands Key Missile-Manufacturing Plant," *Wall Street Journal*, July 1, 2018, https://www.wsj.com/articles/north-korea-expands-key-missile-manufacturing-plant-1530486907.

[97] Ellen Nakashima and Joby Warrick, "U.S. Spy Agencies: North Korea is Working on New Missiles," *Washington Post*, July 30 2018, https://www.washingtonpost.com/world/national-security/us-spy-agencies-north-korea-is-working-on-new-missiles/2018/07/30/b3542696-940d-11e8-a679-b09212fb69c2_story.html.

[98] Zachary Cohen, "New Satellite Images Reveal Activity at Unidentified North Korean Missile Base," *CNN*, December 5, 2018, https://edition.cnn.com/2018/12/05/politics/north-korea-satellite-images-missile-base/index.html. See also Jeffrey Lewis and Dave Schmerler, "North Korean Missile Base at Yeongjeo-dong," *Arms Control Wonk*, December 6, 2018, https://www.armscontrolwonk.com/archive/1206442/north-korean-missile-base-at-yeongjeo-dong/.

[99] Joseph Bermudez, Victor Cha and Lisa Collins, "Undeclared North Korea: The Sakkanmol Missile Operating Base," *Beyond Parallel*, Center for Strategic and International Studies, November 12, 2018, https://beyondparallel.csis.org/undeclared-north-korea-sakkanmol-missile-operating-base/.

(5) Diminishing the Role and Significance of Nuclear Weapons in National Security Strategies and Policies

A) The current status of the roles and significance of nuclear weapons

The U.S. Trump administration published its NPR in February 2018.[100] In the report, the United States assesses that "global threat conditions have worsened markedly since the most recent, 2010 NPR" (p. 2) and "[d]espite concerted U.S. efforts to reduce the role of nuclear weapons in international affairs and to negotiate reductions in the number of nuclear weapons, since 2010 no potential adversary has reduced either the role of nuclear weapons in its national security strategy or the number of nuclear weapons it fields. Rather, they have moved decidedly in the opposite direction." (p. 7) This implies that the Trump administration prioritizes the role of nuclear deterrence in order to address an unstable security environment,[101] while it follows many of the concrete nuclear postures and policies of the previous administration. One of the particular differences from the NPR 2010 was with regard to policies on arms control and non-proliferation, addressed in the last chapter of the NPR 2018. Meanwhile, at the 2018 NPT PrepCom, the U.S. reiterated that the NPR 2018 did not intend to expand the role of nuclear weapons in U.S. policy, but to keep the threshold for nuclear use high by ensuring that any potential adversary would find the prospect of nuclear use profoundly unattractive.

Russia's President Putin warned in March 2018 that Russia would retaliate immediately against any use of nuclear weapons against Russia or its allies, and emphasized that Russia has developed nuclear forces which are capable of penetrating the U.S. missile defense system.[102] On the other hand, at the 2018 NPT PrepCom, Russia stated: "The role of nuclear weapons in Russia's Military Doctrine has been seriously reduced. Their possible use is limited only to following extraordinary circumstances: the use of WMD against Russia or its allies and a hypothetical situation when aggression against our country threatens the very existence of the State. In other words, these are provisions of a purely defensive nature. A concept of 'non-nuclear deterrence' was also included in Russia's Military Doctrine."[103]

Contrary to the previous year when North Korea, Russia and the United States conducted several nuclear-related activities that their adversaries saw as provocations, the behaviors of nuclear-armed states in 2018 were highly restrained, for instance: North Korea did not conduct nuclear

[100] Regarding basic policies of other nuclear-armed states, see *Hiroshima Report 2017*.

[101] The NPR 2018 also mentioned, with implying the significance of its nuclear deterrence for the international security and stability: "Since the introduction of U.S. nuclear deterrence, U.S. nuclear capabilities have made essential contributions to the deterrence of nuclear and non-nuclear aggression. The subsequent absence of Great Power conflict has coincided with a dramatic and sustained reduction in the number of lives lost to war globally." (p. 17)

[102] "Presidential Address to the Federal Assembly," President of Russia, March 1, 2018, http://en.kremlin.ru/events/president/news/56957.

[103] "Statement by Russia," Cluster 1, 2018 NPT PrepCom, April 26, 2018.

or missile tests, and the United States did not dispatch strategic bombers or aircraft carriers to the Korean Peninsula.

Column 4

Different Perspectives in Examining Nuclear Deterrence in the 21st Century

Beyza Unal

1. Introduction

Nuclear deterrence has been at the centre of nuclear non-proliferation and disarmament discussion for several decades and appears set to retain this position for many decades more. What is it about nuclear deterrence that policymakers and experts cannot agree upon? Is it possible to consider nuclear deterrence in the 21st century in a similar fashion to how it was during the Cold War?

There is a growing danger in considering nuclear deterrence as if it is an extension of politics-as-usual. There exist different perspectives in examining nuclear deterrence in the 21st century, especially opposing views on the role of nuclear deterrence; whether it promotes or impedes security? At the Non-Proliferation Treaty Review Committee and Preparatory Committee meetings, deterrence remains the unspoken elephant in the room. So, what are the issues within the deterrence debate that require careful consideration in the 21st century?

2. Underlying assumptions of deterrence theory

The masterminds behind deterrence (such as Thomas Schelling, Bernard Brodie, Albert Wohlshetter) conceptualised deterrence theory based on Cold War parameters. The assumptions at the time were shaped by the bipolar world structure. Rationality for instance was regarded as the backbone of decision-making and that reducing the incentives to strike first would assure strategic stability. Although some of these assumptions may still hold true, taking them for granted and not questioning their value at present times would limit our understanding of international security and how states may behave in times of crisis.

Today, nuclear deterrence does not rest on crisis stability. In fact, there have been decades of peace among major powers; yet, such peace has been eroding gradually as states challenge each other in conventional, nuclear and emerging technology domains. Technological advancements caused a reconsideration of deterrence and at times states might be more prone to use or threaten to use nuclear weapons in case of crisis. In fact, such considerations of nuclear weapons use have become the new normal, contrary to the established taboo; as evidenced by the United States incorporation of cyber elements into their new nuclear posture review.

Deterrence theory also assumes that states are rational actors and that decision-makers make optimal choices based on calculated benefits and costs; and that as the costs of a first-strike would be higher than the benefits for a country, they should rationally choose to maintain the status-quo. We now know that the decision-making process is guided by personal values. The decision to use or threaten to use nuclear weapons is a calculation based on the value that decision-makers attribute to nuclear weapons, and that such calculations vary based on the benefits or the value that a leader views by keeping or using nuclear weapons. Prior to the talks with the United States, Kim Jong-un for instance, was viewed as one of the leaders that could potentially take the world into a catastrophe.[1] To date, there is scepticism between the US-North Korean relations among the American public.[2]

3. Extended deterrence

Extended deterrence today is also different than what had been envisioned during the Cold War. It takes different forms in every region. The U.S. nuclear umbrella that protects the Republic of Korea and Japan, for instance, is often referred to as a symbolic one that cannot be put into practice in times of conflict. The ongoing dialogue between Kim Jong-un and Donald Trump, although positive, has potential unintended ramifications for the security of the Republic of Korea; and it could tip the power dynamics and create new security concerns in the region.

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[1] Friedhoff, K., "The American Public Remains Committed to Defending South Korea," The Chicago Council on Global Affairs, October 2018, https://www.thechicagocouncil.org/sites/default/files/brief_north_korea_ccs18_181001.pdf.

[2] Rasmussen Reports, "Nuclear Fear Falls, But Democrats More Scared of North Korean Threat," June 1, 2018, http://www.rasmussenreports.com/public_content/politics/current_events/north_korea/nuclear_fears_fall_but_democrats_more_scared_of_north_korean_threat; Friedhoff, "The American Public Remains Committed to Defending South Korea."

Similarly, uncertainty over the U.S. commitments to NATO and to other security and economic alliances has raised questions among the nuclear Allied countries. The level of trust within alliances is eroding at a time when Russia has been testing the limits of NATO and the United States, by following activities below the conflict threshold (e.g. cyber-attacks, chemical agents used for assassination purposes in the UK etc.) Worse of all, both the United States and Russia are acquiring each other of lowering the nuclear threshold.[3]

4. Emerging Technologies

Current and future technological developments (e.g. unmanned vehicles, cyber-attacks, anti-satellite weapons, hypersonic glide vehicles etc) pose both risks and opportunities to the nuclear realm. Whereas some experts may claim that emerging technologies reaffirm existing deterrence perspectives; others believe that emerging technologies may impede deterrence.[4] Studies have been published on increased automation and the use of artificial intelligence in the nuclear sector, and the effects that these have upon decision-making processes.[5]

There is an ongoing arms race – notably between China, Russia and the United States – over acquiring hypersonic glide vehicles and hypersonic cruise missiles capability. Hypersonic missiles travel at extreme speeds that current missile defence systems are incapable of intercepting. There is also a growing interest amongst other countries to acquire this technology. When operationalized, hypersonic glide vehicles and hypersonic cruise missiles will tip the deterrence logic, making escalation more likely, since it is hard to detect them when launched, hard to assess their trajectories in flight, hard to determine the target in order to intercept, and hard to stop via existing missile defence systems.[6]

5. Conclusion

This article outlined three areas that require additional thinking when considering deterrence in the 21st century. It is relatively easy to apply old strategies, such as deterrence, to explain

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[3] Bruusgaard K., "The Myth of Russia's Lowered Nuclear Threshold," *War on the Rocks*, September 22, 2017, https://warontherocks.com/2017/09/the-myth-of-russias-lowered-nuclear-threshold/.

[4] See Unal B., Lewis P., *Cybersecurity of Nuclear Weapons Systems*, Chatham House, January 2018; see also, Bidwell C., MacDonald B., "Emerging Disruptive Technologies and their Potential Threat to Strategic Stability and National Security," *Federation of American Scientists*, September 2018.

[5] Sharre P., *Army of None: Autonomous Weapons and the Future of War*, W. W. Norton & Company, 2018.

[6] For more information on hypersonic glide vehicles, see, Speier R.,. Nacouzi G., Lee C., Moore R., *Hypersonic Missile Nonproliferation: Hindering the Spread of a New Class of Weapons*, RAND Corporation, 2017.

new issues. It is harder to assume that deterrence may fail one day and that it is time to think about what type of mitigation measures are necessary to prevent conflict escalation when and if deterrence fails. This does not mean that states who believe in the value of deterrence should change their nuclear postures and policies entirely. It means, initially, that states can explore alternative measures that are complementary to deterrence; so that they could initiate resilience in their nuclear policy.

Today's debate on deterrence lacks the shared understanding that none of the parties would deliberately aim to start conflict or go to war with each other. That shared understanding should be the baseline of every discussion. It might be worthwhile to explore how to create a secure world without nuclear weapons and what would that world look alike. Yet, if that world would be one that replaces deterrence with another policy that is equally problematic as deterrence, then this would not assure peace and stability in the world. Similarly, if underlying assumptions of deterrence or the role of emerging technologies in deterrence policies are not examined carefully, decision-makers will be blindsided by historical analogies and by cases that no longer correspond to present realities. In such scenario, crisis escalation and conflict would become inevitable.

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B) Commitment to "sole purpose," no first use, and related doctrines

In 2018, no nuclear-armed state drastically changed or transformed its policies regarding no first use (NFU) or the "sole purpose" of nuclear weapons. Among the NWS, only China has highlighted a NFU policy. The U.S. previous administration adopted a policy in the NPR 2010 that "[t]he fundamental role of [its] nuclear weapons remains to deter nuclear attack on the United States and its Allies and partners."[104] The NPR 2018 under the Trump administration stated: "The highest U.S. nuclear policy and strategy priority is to deter potential adversaries from nuclear attack of any scale. However, deterring nuclear attack is not the sole purpose of nuclear weapons…The United States would only consider the employment of nuclear weapons in extreme circumstances to defend the vital interests of the United States, its allies, and partners. Extreme circumstances could include significant non-nuclear strategic attacks. Significant non-nuclear strategic attacks include, but are not limited to, attacks on the U.S., allied, or partner civilian population or infrastructure, and attacks on U.S. or allied nuclear forces, their command and control, or warning and attack assessment capabilities."[105]

As for Russia, President Putin stated in March, "[O]ur military doctrine says Russia reserves the right to use nuclear weapons solely in response to a nuclear attack, or an attack with other weapons of mass destruction against the country or its allies, or an act of aggression against us with the use of conventional weapons that threaten the very existence of the state."[106]

With regard to China's NFU policy, which it reaffirmed in 2018, the United States considers that "[t]here is some ambiguity, however, over the conditions under which China's NFU policy would no longer apply…China's lack of transparency regarding the scope and scale of its nuclear modernization program raises questions regarding its future intent."[107]

As for the other nuclear-armed states, India maintains a NFU policy despite reserving an option of nuclear retaliation vis-à-vis a major biological or chemical attack against it. On the other hand, Pakistan, which has developed short-range nuclear weapons to counter the 'Cold Start doctrine' adopted by the Indian Army,[108] does not exclude the possibility of using nuclear weapons against an opponent's conventional attack.

[104] U.S. Department of Defense, "Report on Nuclear Employment Strategy," June 19, 2013, p. 4.

[105] NPR 2018, pp. 20-21. Although not stated in the NPR, non-nuclear strategic attacks are considered to be caused by bio-chemical, conventional attacks, and even cyber attacks. On the other hand, the United States has not excluded a possibility of using nuclear weapons against non-nuclear attacks.

[106] "Presidential Address to the Federal Assembly," President of Russia, March 1, 2018, http://en.kremlin.ru/events/president/news/56957.

[107] U.S. Department of Defense, *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2018*, May 2018, pp. 75-76.

[108] "Short-Range Nuclear Weapons to Counter India's Cold Start Doctrine: Pakistan PM," *Live Mint*, September 21, 2017, http://www.livemint.com/Politics/z8zop6Ytu4bPiksPMLW49L/Shortrange-nuclear-weapons-to-counter-Indias-cold-start-do.html.

North Korea refrained from nuclear saber-rattling in 2018, whereas it had repeated threats of preemptive nuclear attacks from 2016 through 2017.

C) Negative security assurances

No NWS significantly changed its negative security assurance (NSA) policy in 2018: China is the only NWS that has declared an unconditional NSA for NNWS; other NWS add some conditionality to their NSA policies. The United Kingdom and the United States declared they would not to use or threaten to use nuclear weapons against NNWS that are parties to the NPT and in compliance with their non-proliferation obligations. The U.K.'s additional condition is that: "while there is currently no direct threat to the United Kingdom or its vital interests from States developing capabilities in other weapons of mass destruction, for example chemical and biological, we reserve the right to review this assurance if the future threat, development and proliferation of these weapons make it necessary."[109] The United States in its NPR 2018 clarifies: "Given the potential of significant non-nuclear strategic attacks, the United States reserves the right to make any adjustment in the assurance that may be warranted by the evolution and proliferation of non-nuclear strategic attack technologies and U.S. capabilities to counter that threat."[110]

In 2015, France slightly modified its NSA commitment, which is that: "France will not use nuclear weapons against states not armed with them that are signatories of the NPT and that respect their international obligations for non-proliferation of weapons of mass destruction."[111] The condition it added in 2015 was that its commitment does not "affect the right to self-defence as enshrined in Article 51 of the United Nations Charter."[112] Russia maintains the unilateral NSA under which it will not use or threaten to use nuclear weapons against the NNWS parties to the NPT unless it or its allies are invaded or attacked by a NNWS in cooperation with a NWS.

Except under protocols to the nuclear-weapon-free zone (NWFZ) treaties, NWS have not provided legally-binding NSAs. At various fora, including the NPT review process, the Conference on Disarmament (CD) and the UN General Assembly, NNWS, mainly the NAM states, urged NWS to provide legally-binding security assurances. At the 2018 NPT PrepCom, Iran proposed to adopt a separate "decision on negative security assurances" at the upcoming 2020 NPT RevCon, in which the Conference confirms that: all the NWS unequivocally undertake to refrain, under any and all circumstances and without discrimination or exception of any kind, from the use or threat of use of nuclear weapons against any NNWS party to the NPT; and all the NWS solemnly undertake

[109] NPT/CONF.2015/29, April 22, 2015.

[110] U.S. Department of Defense, NPR 2018, p. 21.

[111] In its report submitted to the 2014 PrepCom (NPT/CONF.2015/PC.III/14, April 25, 2014), France stated that it "has given security assurance to all non-nuclear-weapon States that comply with their non-proliferation commitments."

[112] NPT/CONF.2015/10, March 12, 2015.

to pursue negotiations on providing universal, legally binding, effective, unconditional, non-discriminatory and irrevocable security assurances to all NPT NNWS against the use or threat of use of nuclear weapons under all circumstances, within the CD, and bring them to a conclusion no later than 2023.[113] Among NWS, only China argues that the international community should negotiate and conclude at an early date an international legal instrument on providing unconditional NSAs. Meanwhile, France stated that it "considers [the] commitment [on security assurances in its statement in April 1995] legally binding, and has so stated."[114]

As written in the previous *Hiroshima Reports*, while one of the purposes of the NSAs provided by NWS to NNWS is to alleviate the imbalance of rights and obligations between NWS and NNWS under the NPT, India, Pakistan and North Korea also offered NSAs to NNWS. India declared that it would not use nuclear weapons against NNWS, except "in the event of a major attack against India, or Indian forces anywhere, by biological or chemical weapons, India will retain the option of retaliating with nuclear weapons." Pakistan has declared an unconditional NSA. In addition, North Korea has stated an NSA vis-a-vis NNWS so long as they do not join nuclear weapons states in invading or attacking it.

Table 1-6: The status of signature and ratification of protocols to NWFZ treaties on NSAs

	China	France	Russia	U.K.	U.S.
Treaty of Tlatelolco	○	○	○	○	○
Treaty of Rarotonga	○	○	○	○	△
Southeast Asian NWFZ (SEANWFZ) Treaty					
Treaty of Pelindaba	○	○	○	○	△
Central Asia NWFZ (CANWFZ) Treaty	○	○	○	○	△

[○: Ratified △: Signed]

[113] NPT/CONF.2020/PC.II/WP.28, April 13, 2018.

[114] NPT/CONF.2015/PC.III/14, April 25, 2014.

D) Signing and ratifying the protocols of the treaties on nuclear-weapon-free zones

The protocols to the nuclear-weapon-free zone (NWFZ) treaties include the provision of legally-binding NSAs. At the time of writing, only the Protocol of the Treaty for the Prohibition of Nuclear Weapons in Latin America and Caribbean (the Treaty of Tlatelolco) has been ratified by all NWS, as shown in Table 1-6 below. No new progress regarding additional ratifications by NWS has made in 2018. Among others, as for the Protocol to the Southeast Asian NWFZ Treaty, the five NWS have continued consultation with the state parties to the Treaty to resolve remaining differences, but they have yet to sign the Protocol.[115]

Some NWS have stated reservations or added interpretations to the protocols of the NWFZ treaties when signing or ratifying them. NAM and NAC have called for the withdrawal of any related reservations or unilateral interpretative declarations that are incompatible with the object and purpose of such treaties.[116] However, it seems unlikely that any of the NWS will accept such a request. Upon ratification of the Protocol to the Central Asian NWFZ Treaty, for example, Russia made a reservation of providing its NSA in the event of an armed attack against Russia by a state party to the Treaty jointly with a state possessing nuclear weapons. Russia also "reserves the right not to consider itself bound by the Protocol, if any party to the Treaty 'allows foreign military vessels and aircraft with nuclear weapons or other nuclear explosive devices aboard to call at its ports and landing at its aerodromes, or any other form of transit of nuclear weapons or other nuclear explosive devices through its territory.'"[117]

E) Relying on extended nuclear deterrence

The United States and its allies, including NATO countries, Australia, Japan and South Korea, maintained their respective policies on extended nuclear deterrence. No significant change in their related policies was found in 2018. Currently, the United States deploys approximately 150 B-61 nuclear gravity bombs in five NATO countries (Belgium, Germany, Italy, the Netherlands and Turkey), and thus maintains nuclear sharing arrangements with them NATO's Nuclear Planning Group also supports the U.S. extended nuclear deterrence. While no U.S. nuclear weapon is deployed outside of American territory, except in the European NATO countries mentioned above, the United States has established consultative mechanisms on extended deterrence with Japan and South Korea.

The United States reaffirms its commitments on extended deterrence in the NPR 2018.[118] In

[115] As mentioned in the *Hiroshima Report 2016*, both ASEAN member states and NWS implied that they continued consultations over possible reservations by NWS.

[116] See, for instance, NPT/CONF.2018/WP.19, March 23, 2018.

[117] "Putin Submits Protocol to Treaty on Nuclear-Free Zone in Central Asia for Ratification," *Tass*, March 12, 2015, http://tass.ru/en/russia/782424.

[118] NPR 2018, pp. 34-37.

the summit declaration in July 2018, the heads of NATO member countries stated: "As long as nuclear weapons exist, NATO will remain a nuclear alliance. The strategic forces of the Alliance, particularly those of the United States, are the supreme guarantee of the security of Allies."[119] Japan also reaffirmed in the "National Defense Program Guidelines for FY 2019 and beyond" that: "In dealing with the threat of nuclear weapons, U.S. extended deterrence, with nuclear deterrence at its core, is essential: Japan will closely cooperate with the United States to maintain and enhance its credibility."[120]

On the matter of the NATO nuclear sharing arrangements, especially the U.S. deployment of its tactical nuclear weapons in five NATO countries, some NNWS criticize this situation as a clear violation of non-proliferation obligations under Article I of the NPT by those transferor NWS and under Article II by those recipient NNWS. Russia and China have called on NATO to withdraw the U.S. tactical nuclear weapons from the European NATO countries, and to end the nuclear sharing policy.

(6) De-alerting or Measures for Maximizing Decision Time to Authorize the Use of Nuclear Weapons

In 2018, there were no significant changes in nuclear-armed states' policies on alert and/or operational status of their respective nuclear forces.[121] Russian and U.S. strategic ballistic missiles have been on high alert status,[122] either launch on warning (LOW) or launch under attack (LUA). In the NPR 2018, the United States—while mentioning that "[t]his posture maximizes decision time and preserves the range of U.S. response options"—reaffirmed to maintain the existing alert posture, and mentioned: "The de-alerting of U.S. ICBMs would create the potential for dangerous deterrence instabilities by rendering them vulnerable to a potential first strike and compelling the United States to rush to re-alert in a crisis or conflict."[123]

Forty U.K. nuclear warheads and 80 French ones are also kept on alert under their continuous SSBN patrols, albeit at lower readiness levels than those of the two nuclear superpowers.[124] It is assumed that China's nuclear forces are not on a hair-trigger alert posture because it claims to keep nuclear warheads de-mated from delivery

[119] "Brussels Summit Declaration," Issued by the Heads of State and Government participating in the meeting of the North Atlantic Council in Brussels, July 11-12, 2018, https://www.nato.int/cps/en/natohq/official_texts_156624.htm.

[120] "National Defense Program Guidelines for FY 2019 and beyond," December 18, 2018.

[121] See also the *Hiroshima Report 2017*.

[122] Hans M. Kristensen, "Reducing Alert Rates of Nuclear Weapons," Presentation to NPT PrepCom Side Event, Geneva, April 24, 2013; Hans M. Kristensen and Matthew McKinzie, "Reducing Alert Rates of Nuclear Weapons," United Nations Institute for Disarmament Research, 2012.

[123] NPR 2018, p. 22.

[124] See Kristensen, "Reducing Alert Rates of Nuclear Weapons"; Kristensen and McKinzie, "Reducing Alert Rates of Nuclear Weapons."

vehicles.[125] There is little definitive information regarding the alert status of other nuclear-armed states' nuclear forces. It is widely considered that India's nuclear forces are not on a high alert status. In February 2014, Pakistan stated that it "would not delegate advance authority over nuclear arms to unit commanders, even in the event of crisis with India, [...and] all weapons are under the central control of the National Command Authority, which is headed by the prime minister."[126]

A number of NNWS have urged the NWS to alter their alert posture. Among them, Chile, Malaysia, Nigeria, New Zealand and Switzerland, as the "De-alerting Group," proactively proposed that alert levels be reduced. At the 2018 NPT PrepCom, the Group urged the NWS to urgently take steps to reduce operational readiness.[127] The Group, together with other countries, submitted to the UN General Assembly in 2018 a draft resolution, titled "Decreasing the operational readiness of nuclear weapons systems," which was adopted by 175 countries' approval.[128] Five countries (including France, Russia, the United Kingdom and the United States) were against, and five countries (including Israel, South Korea and North Korea) abstained.

Proponents of de-alerting have often argued that such measures are useful to prevent accidental use of nuclear weapons.[129] On the other hand, NWS emphasize that they have taken adequate measures for preventing accidental use, and express confidence regarding the safety and effective control of their nuclear arsenals.[130] Beyond the NWS, India and Pakistan extended their bilateral Agreement on Reducing the Risk of Accidents Relating to Nuclear Weapons in

[125] On the other hand, the U.S. Defense Department's annual report on China's military and security mentioned: "PLA writings express the value of a "launch on warning" nuclear posture, an approach to deterrence that uses heightened readiness, improved surveillance, and streamlined decision-making processes to enable a more rapid response to enemy attack. These writings highlight the posture's consistency with China's nuclear "No First Use" policy, suggesting it may be an aspiration for China's nuclear forces. China is working to develop a space-based early warning capability that could support this posture in the future." U.S. Department of Defense, *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2018*, May 2018, p. 77.

[126] Elaine M. Grossman, "Pakistani Leaders to Retain Nuclear-Arms Authority in Crises: Senior Official," *Global Security Newswire*, February 27, 2014, http://www.nti.org/gsn/article/pakistani-leaders-retain-nuclear-arms-authority-crises-senior-official/.

[127] "Statement by Malaysia on Behalf of the De-alerting Group," Cluster 1, 2018 NPT PrepCom, April 25, 2018.

[128] A/RES/73/60, December 5, 2018.

[129] For example, Patricia Lewis, et.al., published a report, in which they studied 13 cases of inadvertent near misuse of nuclear weapons, and concluded, *inter alia*, that "the world has, indeed, been lucky." They argue, "For as long as nuclear weapons exist, the risk of an inadvertent, accidental or deliberate detonation remains. Until their elimination, vigilance and prudent decision-making in nuclear policies are therefore of the utmost priority. Responses that policy-makers and the military should consider include buying time for decision-making, particularly in crises; developing trust and confidence-building measures; refraining from large-scale military exercises during times of heightened tension; involving a wider set of decision-makers in times of crisis; and improving awareness and training on the effects of nuclear weapons." Patricia Lewis, Heather Williams, Benoît Pelopidas and Sasan Aghlani, "Too Close for Comfort: Cases of Near Nuclear Use and Options for Policy," *Chatham House Report*, April 2014.

[130] See the *Hiroshima Report 2017*.

February 2017. Pakistan, which values SRBM forces for deterrence vis-à-vis India, emphasizes that its nuclear weapons and fissile material are unlikely to fall under the control of any extremist element since their nuclear arsenals are under robust, safe and complete civilian command-and-control system through the Nuclear Command Authority (NCA).[131] Although the U.S. past administrations had treated Pakistani nuclear weapons as adequately controlled, the Trump administration has expressed concerns about Pakistan's development of tactical nuclear weapons and fissile material, which might be more susceptible to terrorist theft,[132] and called on Pakistan to take appropriate preventive measures.[133]

(7) CTBT

A) Signing and ratifying the CTBT

As of December 2018, 167 of the 184 signatories have deposited their instruments of ratification of the Comprehensive Nuclear-Test-Ban Treaty (CTBT). Tuvalu signed and Thailand ratified in 2018. Among the 44 states listed in Annex 2 of the CTBT, whose ratification is a prerequisite for the treaty's entry into force, five states (China, Egypt, Iran, Israel and the United States) have signed but not ratified, and three (India, North Korea and Pakistan) have not even signed. Among the countries surveyed, Saudi Arabia and Syria, have not signed the CTBT either. At the Geneva Conference on Disarmament in May 2018, North Korea's ambassador to the United Nations in Geneva Han Tae Song said that, "Discontinuation of nuclear tests and follow up measures are an important process for global disarmament and DPRK will join international disarmament efforts for a total ban on nuclear tests."[134] However, he did not clarify whether Pyongyang would join the CTBT. In October, Pakistan proposed a bilateral arrangement on a nuclear test ban with India,[135] but its intention is not clear.

As for efforts to promote CTBT entry into force during 2018, the Ninth Ministerial Meeting of the Friends of the CTBT, under joint chairpersons of Australia and Japan, met on September 27. In its joint statement, participating countries reaffirmed their efforts for early entry into force and universalization of the CTBT as

[131] "Short-Range Nuclear Weapons to Counter India's Cold Start Doctrine: Pakistan PM," *Live Mint*, September 21, 2017, http://www.livemint.com/Politics/z8zop6Ytu4bPiksPMLW49L/Shortrange-nuclear-weapons-to-counter-Indias-cold-start-do.html.

[132] "US Worried Pakistan's Nuclear Weapons Could Land Up in Terrorists' Hands: Official." *Economic Times*, August 25, 2017, https://economictimes.indiatimes.com/news/defence/us-worried-pakistans-nuclearweapons-could-land-up-in-terrorists-hands-official/articleshow/60220358.cms.

[133] "Remarks by President Trump on the Strategy in Afghanistan and South Asia." White House, August 21, 2017, https://www.whitehouse.gov/briefings-statements/remarks-president-trump-strategy-afghanistan-south-asia/.

[134] "North Korea Will Join 'Efforts for a Total Ban on Nuclear Tests,'" *Reuters*, May 15, 2018, https://www.reuters.com/article/us-northkorea-nuclear-tests/north-korea-will-join-efforts-for-a-total-ban-on-nuclear-tests-idUSKCN1IG28E.

[135] "Pakistan Proposes N-Test Ban Arrangement with India," *The Nation*, October 11, 2018, https://nation.com.pk/11-Oct-2018/pakistan-proposes-n-test-ban-arrangement-with-india.

well as its verification system, and demanded North Korea's signature and ratification of the CTBT.[136] In July, Japan's Foreign Minister Taro Kono and CTBTO Director General Lassina Zerbo presented a joint appeal for revitalizing an effort of early entry into force of the CTBT.[137]

As for outreach activities for promoting the Treaty's entry into force, a document, "Activities Undertaken by Signatory and Ratifying States Under Measure (K) of the Final Declaration of the 2015 Article XIV Conference in the Period June 2015-May 2017,"[138] distributed at the Article XIV Conference, summarized activities conducted by ratifying and signatory states. It highlighted:

- Bilateral activities related to Annex 2 states (conducted by Australia, Austria, Belgium, Brazil, Canada, France, Japan, Mexico, New Zealand, Russia, Turkey, the UAE, the U.K. and others);
- Bilateral activities related to non-Annex 2 states (conducted by Australia, Austria, Belgium, Brazil, Canada, France, Japan, Mexico, New Zealand, Russia, Sweden, Turkey, the U.K. and others);
- Global-level activities (conducted by Australia, Belgium, Brazil, Canada, France, Japan, Mexico, New Zealand, Russia, Turkey, the UAE, the U.K., the U.S. and others); and
- Regional-level activities (conducted by Australia, Belgium, Brazil, Canada, France, Japan, Mexico, New Zealand, Turkey, the UAE and others).

B) Moratoria on nuclear test explosions pending CTBT's entry into force

The five NWS plus India and Pakistan maintain a moratorium on nuclear test explosions. Israel, which has kept its nuclear policy opaque, has not disclosed the possibility of conducting nuclear tests.

North Korea, at the Plenary Meeting of the Central Committee of the Workers' Party of Korea on May 20, 2018, decided to withhold nuclear and ICBM testing, and shut down its Punggye-ri nuclear test site for ensuring transparency of halting nuclear tests. On May 24, North Korea dynamited the Punggye-ri tunnels. However, it is not clear whether the nuclear test site was irreversibly destroyed because no inspectors or experts were invited to this event of "destruction." Although Chairman Kim Jong-un reportedly stated at the South-North Korean summit meeting in September that the Punggye-ri nuclear test site would be

[136] "Joint Ministerial Statement on the Comprehensive Nuclear-Test-Ban Treaty," Ninth Ministerial Meeting of the Friends of the CTBT, New York, September 26, 2018.

[137] "Joint Appeal by Mr. Taro Kono, Minister for Foreign Affairs of Japan, and Dr. Lassina Zerbo, Executive Secretary of the Provisional Technical Secretariat of the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization," Vienna, 5 July 2018.

[138] CTBT-Art.XIV/2017/4, September 14, 2017.

shown to experts, no such visit took place in 2018.[139] If the explosions in May were conducted just near the entrance of the tunnels, it is likely that they could be used again after boring.[140]

The United States mentioned nuclear test-related policies in the NPR 2018, as follows: maintaining the capability to resume underground nuclear explosive testing if called upon to do so; not seeking Senate ratification of the CTBT, but continuing to observe a nuclear test moratorium; remaining ready to resume nuclear testing if necessary to meet severe technological or geopolitical challenges.[141] In addition, according to the NNSA report released in November 2017, "NNSA maintains the readiness to conduct an underground nuclear test, if required, for the safety and effectiveness of the Nation's stockpile, or if otherwise directed by the President," and indicates "general testing estimates"—24-36 months for the previous administration—as follows:[142]

- 6 to 10 months for a simple test, with waivers and simplified processes;
- 24 to 36 months for a fully instrumented test to address stockpile needs with the existing stockpile; and
- 60 months for a test to develop a new capability

Former administrator of the NNSA Linton Brooks said that the purpose of conducting a "simple test" is to demonstrate "political resolve."[143]

C) Cooperation with the CTBTO Preparatory Commission

Regarding the countries surveyed in this study, the status of payments of contributions to the CTBTO, as of 2018, is as follows.[144]

- Fully paid: Australia, Austria, Belgium, Canada, China, Egypt, France, Germany,

[139] The CTBTO expressed its intention to provide resources and expertise to confirm an actual dismantlement of the North Korea's nuclear test site if Pyongyang decided to open the site to experts. CTBTO executive secretary Lassina Zerbo also mentioned that the CTBTO has a capacity to verify the nuclear test site in North Korea, and such verification contributes to increasing credibility of the North's denuclearization as well as improving the CTBTO's verification capability. Umer Jamshaid, "CTBTO Willing To Join Int'l Efforts Seeking N.Korea Denuclearization - Executive Secretary," *UrduPoint Network*, October 15, 2018, https://www.urdupoint.com/en/world/ctbto-willing-to-join-intl-efforts-seeking-n-456466.html; Lassina Zerbo, "The Nuclear Test Ban and the Verifiable Denuclearization of North Korea," *Arms Control Today*, Vol. 48, No. 9 (November 2018).

[140] U.S. experts pointed out: "Analysis of ground photos and video taken at North Korea's Punggye-ri Nuclear Test Site (courtesy of Sky News) from the recent site closing event can confirm only that the test tunnel entrances were sealed. At most, two other point detonations were carried out (as was claimed) in each of the three tunnels, while the tunnel branches probably remain intact." Frank V. Pabian, Joseph S. Bermudez Jr. and Jack Liu, "More Potential Questions About the Punggye-ri Nuclear Test Site Destruction," *38 North*, June 11, 2018, https://www.38north.org/2018/06/punggye060818/.

[141] NPR 2018, p. 63.

[142] National Nuclear Security Administration, *Stockpile Stewardship and Management Plan: Fiscal Year 2018*, November 2017, p. 3-26.

[143] Masakatsu Ota, "Trump Administration Moving to Beef Up Nuclear Test Readiness," *Kyodo News*, December 4, 2017, https://english.kyodonews.net/news/2017/12/206015ba6bbf-trump-administration-moving-to-beef-up-nuclear-test-readiness.html.

[144] CTBTO, "CTBTO Member States' Payment as at 31-Dec-2018," https://www.ctbto.org/fileadmin/user_upload/treasury/37._10_September_2018_Member_States__Payments.pdf.

Indonesia, Israel, Japan, Kazakhstan, South Korea, the Netherlands, New Zealand, Norway, the Philippines, Poland, Russia, South Africa, Sweden, Switzerland, Turkey, the UAE, the U.K. and the U.S.

- Partially paid: Chile, Mexico
- Not paid: Brazil
- Voting right in the Preparatory Commission suspended because arrears are equal to or larger than its contributions due for the last two years: Iran and Nigeria

D) Contribution to the development of the CTBT verification systems

The establishment of the CTBT verification system has steadily progressed. The pace of establishing the International Monitoring System (IMS) stations in China, Egypt and Iran—in addition to those of India, North Korea, Pakistan and Saudi Arabia which have yet to sign the CTBT—has been lagging behind, compared to that in the other signatory countries.[145] Regarding China, however, two radionuclide stations and two primary seismic stations were certified by the CTBTO in the end of January 2018. In all, five among 11 planned monitoring stations in China have been certified.[146]

In May-June 2018, the Second CTBT Science Diplomacy Symposium was held, in which discussion sessions, keynote speeches, hands-on simulation exercises and a field trip were carried out for developing verification and monitoring technologies.[147]

Regarding individual contributions of ratifying countries, the EU approved in February 2018 to provide a voluntary contribution of 4.5 million Euro to the CTBTO. Collectively, the EU Member States provide 40% of the CTBTO's regular budget.[148] In February 2017, Japan announced a voluntary contribution of US$ 2.43 million to the CTBTO "to further boost its verification abilities to detect nuclear explosions anywhere on the planet." The funding is to be used especially to procure and deploy a mobile noble gas detection system (US$ 1.64 million),[149] which is installed in the northern part of Japan for the first two years.[150] Observation of noble

[145] CTBTO, "Station Profiles," http://www.ctbto.org/verification-regime/station-profiles/.

[146] CTBTO, "Remarkable Progress: China and the CTBT," February 2, 2018, https://www.ctbto.org/press-centre/highlights/2018/remarkable-progress-china-and-the-ctbt/; "4 China-hosted nuclear activity monitoring stations certified by CTBTO," *Xinhua*, February 1, 2018, http://www.xinhuanet.com/english/2018-02/01/c_136940100.htm.

[147] CTBTO, "2nd CTBT Science Diplomacy Symposium," May 31, 2018, https://www.ctbto.org/press-centre/highlights/2018/2nd-ctbt-science-diplomacy-symposium/.

[148] CTBTO, "European Union Champions the CTBTO—Voluntary Contribution of Over 4.5 Mio EUR," April 30, 2018, https://www.ctbto.org/press-centre/highlights/2018/european-union-champions-the-ctbto-voluntary-contribution-of-over-45-mio-eur/.

[149] "Japan Gives US$ 2.43 Million to Boost Nuclear Test Detection," CTBTO, February 23, 2017, https://www.ctbto.org/press-centre/highlights/2017/japan-gives-us-243-million-to-boost-nuclear-test-detection/.

[150] "Transportable Radioxenon Systems (Txls) Enhance the CTBTO's Radionuclide Monitoring Technology in Japan," January 23, 2018, https://www.ctbto.org/press-centre/highlights/2018/transportable-radioxenon-systems-txls-enhance-the-ctbtos-radionuclide-monitoring-technology-in-japan/.

gas started in Horonobe (January 2018) and Mutsu (March 2018), respectively.

E) Nuclear testing

No country conducted a nuclear test explosion in 2018. North Korea, which carried out six tests from 2006 to 2017, announced that it no longer needed a nuclear test and nuclear test site because of completing its development of nuclear forces.

Regarding experimental activities other than a nuclear explosion test, the United States continues to conduct various non-explosive tests and experiments under the Stockpile Stewardship Program (SSP), in order to sustain and assess its nuclear weapons stockpile without the use of underground nuclear tests, such as subcritical tests and experiments using the Z machine, which generates X-rays by fast discharge of capacitors, thus allowing for exploring the properties of plutonium materials under extreme pressures and temperatures. The U.S. NNSA had released quarterly reports on such experiments, but as of December 2018 has not updated it since the first quarter of FY 2015. On the other hand, according to a newsletter published by the NNSA in March 2018, the United States conducted a subcritical test, named "Vega," on December 13, 2017.[151] The first subcritical test under the Trump administration, it involved new explosives used to create powerful impacts on plutonium, and an examination of a plutonium implosion.[152]

France clarified that it has conducted "activities aimed at guaranteeing the safety and reliability of its nuclear weapons [including] a simulation program and hydrodynamic experiments designed to model materials' performance under extreme physical conditions and, more broadly, the weapons' functioning."[153] However, no further detail was reported. Meanwhile, France and the United Kingdom agreed to build and jointly operate radiographic and hydrodynamic testing facilities under the Teutates Treaty concluded in November 2010.[154] The status of the remaining nuclear-armed states' non-explosive testing activities in this respect is not well-known since they do not release any information. Meanwhile, it was reported:

> China is aggressively developing its next generation of nuclear weapons, conducting an average of five tests a month to simulate nuclear blasts…Between September 2014 and last December, China carried out around 200 laboratory experiments to simulate the extreme physics of a nuclear blast, the China Academy of Engineering Physics reported in a document released by the government earlier this year and reviewed by the South China Morning Post this month…The tests are conducted using a large, sophisticated facility known as a multi-stage gas gun, which simulates the extreme heat, pressure

[151] Garry R. Maskaly, "Vega & the Lyra Series," *Stockpile Stewardship Quarterly*, NNSA, Vol. 8, No. 1 (March 2018), p. 6, http://inpp.ohiou.edu/~meisel/assets/file/SSAPQuarterlyVolume8.pdf.

[152] "US Held Subcritical Nuclear Test Last Dec.," *NHK*, October 10, 2018, https://www3.nhk.or.jp/nhkworld/en/news/20181010_27/.

[153] NPT/CONF.2015/PC.III/14, April 25, 2014.

[154] NPT/CONF.2015/29, April 22, 2015.

and shock waves produced in a real nuclear blast. The experiments with the gas gun provide scientists with the data they need to develop more advanced nuclear weapons.[155]

In December 2018, it was reported that China is trying to build a Chinese version of U.S. "Z machine," a pulsed-power facility used in the development of new warhead designs by testing how particles react under extreme radiation and magnetic pressure.[156]

While the CTBT does not prohibit any nuclear test unaccompanied by an explosion, the NAM countries have demanded that nuclear-armed states, inter alia, refrain from conducting nuclear weapon test explosions or any other nuclear explosions, and to close and dismantle, in a transparent, irreversible and verifiable manner, any remaining sites for nuclear test explosions and their associated infrastructure.[157] Different from the CTBT, which prohibits any nuclear test "explosion," the TPNW bans "nuclear tests," which can be interpreted to mean that it bans tests that do not produce an explosion. On the other hand, the TPNW does not stipulate measures for verifying the testing ban.

(8) FMCT

A) Efforts toward commencing negotiations on an FMCT

In the "Decision 2: Principles and Objectives for Nuclear Non-Proliferation and Disarmament" adopted at the 1995 NPT Review and Extension Conference, participating countries agreed on "[t]he immediate commencement and early conclusion of negotiations on a non-discriminatory and universally applicable convention banning the production of fissile material for nuclear weapons or other nuclear explosive devices." However, substantive negotiations have not yet commenced. The 2018 session of the CD adopted a decision to establish five subsidiary bodies to the seven agenda items (Cessation of the nuclear arms race and nuclear disarmament; Prevention of nuclear war, including all related matters; Prevention of an arms race in outer space; Effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons; New types of weapons of mass destruction and new systems of such weapons, and radiological weapons; Comprehensive programme of disarmament; and Transparency in armaments).[158] Although progress toward a commencement of a Fissile

[155] Stephen Chen, "China Steps Up Pace in New Nuclear Arms Race with US and Russia as Experts Warn of Rising Risk of Conflict," *South China Morning Post*, May 28, 2018, http://www.scmp.com/news/china/society/article/2147304/china-steps-pace-new-nuclear-arms-race-us-and-russia-experts-warn.

[156] Stephen Chen, "Operation Z Machine: China's Next Big Weapon in the Nuclear 'Arms Race' Could Create Clean Fuel – Or Deadly Bombs," *South China Monitoring Post*, December 12, 2018, https://www.scmp.com/news/china/science/article/2177652/operation-z-machine-chinas-next-big-weapon-nuclear-arms-race.

[157] NPT/CONF.2018/PC.II/WP.18, March 23, 2018.

[158] "Conference on Disarmament Decides to Establish Five Subsidiary Bodies on Agenda Items to Advance the Substantive Work," United Nations Office at Geneva, February 16, 2018, https://www.unog.ch/80256EDD006B9C2E/(httpNewsByYear_fr)/A3466E06D04B7FF4C125823600543D15?OpenDocument.

Material Cut-Off Treaty (FMCT) negotiation was expected by structured technical discussions under the subsidiary body, the CD in 2018 again ended without adopting a program of work that included the establishment of an Ad Hoc Committee on a FMCT negotiation, due to Pakistan's strong objection, as was the case in previous years. Pakistan has insisted that not just newly produced material but also existing stockpiles of such materials should be subject to the scope of negotiations on a treaty.

China expresses support for the commencement of negotiations on an FMCT prohibiting the future production of fissile material for nuclear weapons, but it does so less actively than the other NWS. In a working paper submitted to the 2018 NPT PrepCom, China argued that "The Conference on Disarmament is the sole appropriate forum for the negotiation of a treaty banning the production of fissile material for nuclear weapons or other nuclear explosive devices."[159] Israel has a similar posture.

Concerned states have pursued various measures for commencing FMCT negotiations at the CD. Among them, the 2016 UN General Assembly decided to establish a High-Level FMCT Expert Preparatory Group, "to consider and make recommendations on substantial elements of a future non-discriminatory, multilateral and internationally and effectively verifiable treaty banning the production of fissile material for nuclear weapons or other nuclear explosive devices, on the basis of CD/1299 and the mandate contained therein." The Group, consisting of experts from 25 countries, convened two-week meetings in 2017 and 2018, respectively, and adopted a final report in June 2018.[160] The report contains four sub-sections covering treaty scope, definitions, verification, legal and institutional arrangements, and other elements (such as a treaty's preamble, and transparency and confidence building measures), and provides a list of possible treaty elements and some of the considerations that negotiators may wish to take into account.

B) Moratoria on production of fissile material for nuclear weapons

Among nuclear-armed states, China, India, Israel, Pakistan and North Korea have not declared a moratorium on the production of fissile material for nuclear weapons. India, Pakistan and North Korea are highly likely to continue producing fissile material for nuclear weapons and expanding production

[159] NPT/CONF.2018/WP.32, April 19, 2018.

[160] A/73/159, July 13, 2018. See also "High Level Fissile Material Cut-Off Treaty (FMCT) Expert Preparatory Group," The United Nations Office at Geneva, https://unog.ch/80256EE600585943/(httpPages)/B8A3B48A3FB7185EC1257B280045DBE3?OpenDocument; Paul Meyer, "UN High-level Fissile Material Cut-Off Treaty Expert Preparatory Group Report: Little Prospect for Progress," *IPFM Blog*, September 26, 2018, http://fissilematerials.org/blog/2018/09/un_high-level_fissile_mat.html. Participating countries are Algeria, Argentina, Australia, Brazil, Canada, China, Colombia, Egypt, Estonia, France, Germany, India, Indonesia, Japan, Mexico, Morocco, Netherlands, Poland, South Korea, Russia, Senegal, South Africa, Sweden, the United Kingdom and the United States. Pakistan refused to participate in the Group. At the Informal Consultative Meeting by the Chairperson of the High-level FMCT Expert Preparatory Group in March 2017, Pakistan argued that it could not join any discussion, pre-negotiation, negotiation or preparatory work on the basis of the Shannon Mandate: that is, considering a treaty which only prohibits future production and leaves the existing stocks untouched.

capabilities.[161] In 2018 North Korea offered to destroy nuclear-related facilities in Yongbyon in exchange for corresponding measures by the United States, but it is widely considered that the North enriches uranium at additional facilities in other locations. China is widely considered not to be producing fissile material for nuclear weapons currently.[162]

None of the nuclear-armed states have declared the amount of fissile material for nuclear weapons which they possess (except for the U.S. declassifying the amount of its past production of HEU and plutonium). Estimates by research institutes are summarized in Chapter 3 of this Report.

(9) Transparency in Nuclear Forces, Fissile Material for Nuclear Weapons, and Nuclear Strategy/Doctrine

In the Final Document of the 2010 NPT RevCon, the NWS were called upon to report on actions taken toward "accelerat[ion of] concrete progress on the steps leading to nuclear disarmament" to the 2014 PrepCom (Action 5). All states parties to the NPT, including the NWS, were also requested to submit regular reports on implementing nuclear disarmament measures agreed at the previous RevCon (Action 20), and the NWS were asked to agree on a standard reporting form, as a confidence-building measure (Action 21).

In accordance with these recommendations, the NWS submitted their respective reports on implementation of the NPT's three pillars (nuclear disarmament, non-proliferation and peaceful use of nuclear energy) to the 2014 NPT PrepCom and the 2015 RevCon, using a common framework, themes and categories. No similar report was submitted by any NWS to the 2018 NPT PrepCom, however. Only six NNWS (Australia, Austria, Canada, Japan, New Zealand, and Switzerland) submitted their respective implementation reports on the NPT.[163]

At the 2018 NPT PrepCom, there were some proposals for improving transparency through regular reporting by the NPT states parties, especially the NWS, to the NPT review process. For instance, the NPDI proposed a new draft form for standard nuclear disarmament reporting based on 64 Actions agreed at the 2010 NPT RevCon, and called for not just NWS but also NNWS to report on the status of their implementations during the 2020 NPT review cycle. The NPDI, furthermore, encouraged the regular submission of transparency reports by these States during the 2020 review cycle. [164]

Previously, at the 2012 NPT PrepCom, the NPDI proposed a draft form for reporting on nuclear warheads, delivery vehicles, fissile material

[161] See the *Hiroshima Report 2017*.

[162] See, for instance, Hui Zhang, "China's Fissile Material Production and Stockpile," *Research Report*, International Panel on Fissile Materials, No. 17 (2017).

[163] Among these countries, Australia, Austria, Canada, Japan and New Zealand also submitted their respective report to the 2017 NPT PrepCom.

[164] NPT/CONF.2020/PC.II/WP.26, April 11, 2018.

for nuclear weapons, and nuclear strategy/policies.[165] Using the draft form, the following table summarizes the degree of transparency taken by the nuclear-weapon/armed states.

[165] NPT/CONF.2015/PC.I/WP.12, April 20, 2012.

Table 1-7: Transparency in nuclear disarmament

■ Nuclear warheads	CHN	FRA	RUS	UK	US	IND	ISR	PAK	PRK
・Total number of nuclear warheads (including those awaiting dismantlement)		○							
・Aggregate number of nuclear warheads in stockpile		○		○	○				
・Number of strategic or non-strategic nuclear warheads		○	△	○	△				
・Number of strategic or non-strategic deployed nuclear warheads		○	△	○	△				
・Number of strategic or non-strategic non-deployed nuclear warheads		○		○	△				
・Reductions (in numbers) of nuclear warheads in 2018			○	○	○				
・Aggregate number of nuclear warheads dismantled in 2018									
■ Delivery vehicles									
・Number of nuclear warhead delivery systems by type (missiles, aircraft, submarines, artillery, other)		○	△	○	○				
・Reduction (in numbers) of delivery systems in 2018			○		○				
・Aggregate number of delivery systems dismantled in 2018									
・Nuclear disarmament since 1995									
・1995-2000		○	○	○	○				
・2000-2005		○	○	○	○				
・2005-2010		○	○	○	○				
・2010-2018		○	○	○	○				
■ Nuclear doctrine									
・Measures taken or in process to diminish the role and significance of nuclear weapons in military and security concepts, doctrines and policies	○	○	○	○	○	○		○	
・Measures taken or in process to reduce the operational readiness of the reporting State's nuclear arsenal	○	○	○	○	○	○		○	
・Measures taken or in process to reduce the risk of accidental or unauthorized use of nuclear weapons	○	○	○	○	○	○		○	
・Description of negative security assurances (including status and definition) by reporting States	○	○	○	○	○	○		○	○
・Current status and future prospect of the ratification of the relevant protocols to nuclear-weapon-free-zone treaties	○	○	○	○	○	–	–	–	–
・Current status of consultations and cooperation on entry into force of the relevant protocols of nuclear-weapon-free-zone treaties	○	○	○	○	○	–	–	–	–
・Current status of review of any related reservations about the relevant protocols of nuclear-weapon-free-zone treaties by concerned States						–	–	–	–
■ Nuclear testing									
・Current status of ratification of the Comprehensive Nuclear-Test-Ban Treaty	△	○	○	○	△		△		
・Current status of the reporting State's policy on continued adherence to the moratorium on nuclear-weapon test explosions	○	○	○	○	○	○		○	
・Activities to promote the entry into force of the Comprehensive Nuclear-Test-Ban Treaty at the national, regional and global levels		○		○	○				
■ Scheduled policy reviews									
・Scope and focus of policy reviews, scheduled or under way, relating to nuclear weapon stocks, nuclear doctrine or nuclear posture				○	○				
■ Fissile material									
・Aggregate amount of plutonium produced for national security purposes (in metric tons)				○	○				
・Aggregate amount of HEU produced for national security purposes (in metric tons)				○	○				
・Amount of fissile material declared excess for national security purposes (in metric tons)			△		△				
・Current status (and any future plan), including the amount and year, of declarations to the International Atomic Energy Agency of all fissile material designated by the reporting State as no longer required for military purposes and placement of such material under Agency or other relevant international verification and arrangements for the disposition of such material for peaceful purposes		○	△	○	△				
・Current status of the development of appropriate legally binding verification arrangements to ensure the irreversible removal of such fissile material			△	△	△				
・Current status (and any future plan) of the dismantlement or conversion for peaceful uses of facilities for the production of fissile material for use in nuclear weapons		○							
■ Other measures in support of nuclear disarmament									
・Any cooperation among Governments, the United Nations and civil society aimed at increasing confidence, improving transparency and developing efficient verification capabilities		○		○	○				
・Year and official document symbol of regular reports on the implementation of Article VI, paragraph 4(c), of the 1995 decision entitled "Principles and objectives for nuclear non-proliferation and disarmament," and the practical steps agreed to in the Final Document of the 2000 Review Conference in 2018									
・Activities to promote disarmament and non-proliferation education		○		○	○				

[○: Highly transparent △: Partially transparent]

(10) Verifications of Nuclear Weapons Reductions

Russia and the United States have implemented verification measures, including on-site inspections, under the New START.[166] Since its entry into force, they have conducted on-site inspections as stipulated in the treaty.[167]

One of the noticeable activities on verification is the "International Partnership for Nuclear Disarmament Verification (IPNDV)," launched by the United States in December 2014. With 27 participating countries (and the EU and Vatican),[168] the IPNDV continues to study verification measures and technologies on dismantlement of nuclear weapons, as well as fissile material derived from dismantled nuclear warheads.

For Phase II (2018-2019) following Phase I (2015-2017),[169] the IPNDV will deepen its understanding of effective and practical verification options to support future nuclear disarmament verification and demonstrate its work through tangible activities such as exercises and demonstrations. For these purposes, the following three working groups will be established: Verification of Nuclear Weapons Declarations; Verification of Reductions; and Technologies for Verification.[170]

In July 2018, the second Joint Working Group Meeting was held in Seoul, at which 20 participating countries and the EU discussed procedures and technologies that can be applied at each of the 14 steps of the nuclear weapons dismantlement "lifecycle."[171] The sixth Plenary Meeting was held in the United Kingdom in December 2018.

Regarding nuclear disarmament verification measures, respective U.K.-U.S. and U.K.-Norway joint developmental work was continued.[172] The EU, in its working paper submitted to the 2018 NPT PrepCom, argued for the importance of establishing a technology and regime for nuclear disarmament verification

[166] The INF Treaty in 1987 is the first nuclear arms reduction treaty stipulating the intrusive verification system, including on-site inspections.

[167] "New START Treaty Inspection Activities," U.S. Department of State, https://www.state.gov/t/avc/newstart/c52405.htm.

[168] In addition to three NWS (France, the United Kingdom and the United States), Australia, Belgium, Brazil, Canada, Chile, Finland, Germany, Hungary, Indonesia, Italy, Japan, Jordan, Kazakhstan, Mexico, Netherlands, Nigeria, Norway, Philippines, Poland, Korea, Sweden, Switzerland, Turkey and others participated in the IPNDV. China and Russia attended in the Phase I, but did not join in the Phase II.

[169] In the summary report of the Phase I, the INPDV identified several specific verification areas for additional analysis as following: Declarations, including within the wider nuclear disarmament process and as complements to more specific monitoring and inspection of nuclear weapon dismantlement; Data handling requirements across the inspection process; Information barrier technologies; Technologies enabling measurements of Special Nuclear Material (SNM) and High Explosives (HE), as well as the development of nuclear weapon templates; and Testing and exercising potentially promising technologies and procedures.

[170] The U.S. Department of State, "The International Partnership for Nuclear Disarmament Verification: Phase II," December 8, 2017, https://www.state.gov/t/avc/rls/2017/276403.htm.

[171] See the IPNDV website (https://www.ipndv.org/events/joint-working-group-meeting-seoul/).

[172] See the *Hiroshima Report 2017*.

by both nuclear and non-nuclear weapon states.[173] In addition, some NNWS call for the involvement of the IAEA regarding, for instance, development and conclusion of legally binding verification arrangements, which would apply to all fissile material permanently removed from nuclear weapons programs. [174]

In May 2018, the first meeting of the Group of Governmental Experts to consider the role of verification in advancing nuclear disarmament—in accordance with the UNGA resolution adopted in 2016—was held by governmental officials from 25 countries. Totally three meetings were to be convened during the period until spring of 2019.[175]

(11) Irreversibility

A) Implementing or planning dismantlement of nuclear warheads and their delivery vehicles

As with their previous nuclear arms control agreements, the New START obliges Russia and the United States to dismantle or convert strategic (nuclear) delivery vehicles beyond the limits set in the Treaty, in a verifiable way. The New START does not stipulate that retired nuclear warheads be dismantled, but the two states have partially dismantled retired nuclear warheads as unilateral measures.

Neither country has provided comprehensive information regarding the dismantlement of nuclear warheads, including the exact numbers of dismantled warheads. However, the United States has disclosed the number of nuclear warheads dismantled per year. According to information from the Defense Department, the United States dismantled 354 nuclear weapons in 2017, up from 258 the year before.[176] France and the United Kingdom also continue to dismantle their retired nuclear warheads and delivery vehicles.

B) Decommissioning/conversion of nuclear weapons-related facilities

Few remarkable activities or progress were reported in 2018 in terms of decommissioning or conversion of nuclear weapons-related facilities.[177] As mentioned above, North Korea declared to close its nuclear test site, but whether the "shutdown" is complete and irreversible has yet to be confirmed.

In 1996, France became the only country to decide to completely and irreversibly

[173] NPT/CONF.2020/PC.II/WP.6, March 8, 2018.

[174] NPT/CONF.2020/PC.II/WP.23, March 26, 2018. See also the *Hiroshima Report 2017*.

[175] The 25 participating countries are: five NWS, 18 NNWS (Algeria, Argentina, Brazil, Chile, Finland, Germany, Hungary, Indonesia, Japan, Kazakhstan, Mexico, Morocco, Netherlands, Nigeria, Norway, Poland, South Africa and Switzerland) and two non-NPT states parties (India and Pakistan). See also Wilton Park, "Verification in Multilateral Nuclear Disarmament: Preparing for the UN Group of Governmental Experts," January 24-26, 2018.

[176] Department of Defense, "Stockpile Numbers: End of Fiscal Years 1962-2017," http://open.defense.gov/Portals/23/Documents/frddwg/2017_Tables_UNCLASS.pdf.

[177] On activities or progress before 2018, see the *Hiroshima Report 2017*.

dismantle its nuclear test sites. They were fully decommissioned in 1998.[178]

C) Measures for fissile material declared excess for military purposes, such as disposition or conversion to peaceful purposes

In October 2016, Russian President Putin issued a Presidential Decree on suspending implementation of the Russian-U.S. Plutonium Management and Disposition Agreement (PMDA),[179] which entered into force in July 2011. Russia argued that it suspended the PMDA in response to U.S. "hostile actions toward Russia" and a "radical change of circumstances"[180] since the agreement was signed in 2000. On the other hand, the United States criticized again in its report on implementation of arms control and nonproliferation, published in April 2018, that although there was no indication of a Russian violation, its decision to suspend the PMDA raises concerns regarding its future adherence to obligations under this Agreement.[181]

The Trump administration, like its predecessor, has sought to end construction of the mixed-oxide (MOX) fuel fabrication Facility (MFFF) at the Savannah River Site in South Carolina, and to pursue the dilution and disposal approach, due to increasing cost and delaying schedule of the MFFF's construction. The Congress has not approved this approach, and allocated a budget for the construction of the MFFF.[182] However, the NNSA formally terminated its construction in October 2018.[183]

Meanwhile, the United States continues to dismantle nuclear warheads at the U.S. Department of Energy's Pantex facility, by removing the plutonium cores from retired warheads. In Energy Department facilities, there are 54 metric tons of surplus plutonium, an amount that is increasing.[184]

Regarding the U.S. surplus HEU, according to the Energy Department FY2019 budget request, the United States will complete down-blending of 162 MT of surplus HEU in FY2019; 159.7 tons having been down-blended already.[185]

[178] NPT/CONF.2015/10, March 12, 2015.

[179] Under the agreement, each country is to dispose no less than 34 metric tons of weapon-grade plutonium removed from their respective defense programs by irradiating it as MOX in existing light-water reactors fuel.

[180] Maggie Tennis, "INF Dispute Adds to U.S.-Russia Tensions," *Arms Control Today*, Vol. 47, No. 5 (June 2017), pp. 29-30.

[181] U.S. Department of State, "Adherence to and Compliance with Arms Control, Nonproliferation, and Disarmament Agreements and Commitments."

[182] Kingston Reif, "MOX Facility to Switch to Plutonium Pits," *Arms Control Today*, Vol. 48, No. 5 (June 2018), p. 29.

[183] Timothy Gardner, "Trump Administration Kills Contract for Plutonium-to-Fuel Plant," *Reuters,* October 13, 2018, https://www.reuters.com/article/us-usa-plutonium-mox/trump-administration-kills-contract-for-plutonium-to-fuel-plant-idUSKCN1MM2N0.

[184] Scot J. Paltrow, "America's Nuclear Headache: Old Plutonium with Nowhere to Go," *Reuters*, April 20, 2018, https://www.reuters.com/article/us-usa-nukes-plutonium-specialreport/americas-nuclear-headache-old-plutonium-with-nowhere-to-go-idUSKBN1HR1KC.

[185] "United States to Down-Blend HEU for Tritium Production," *IPFM Blog*, October 1, 2018, http://fissilematerials.org/blog/2018/10/united_states_to_down-ble.html.

(12) Disarmament and Non-Proliferation Education and Cooperation with Civil Society

Regarding cooperation with civil society in nuclear disarmament and non-proliferation, involvement of civil society in the process of formulating the TPNW was notable.[186]

At the 2018 NPT PrepCom, Ireland submitted a working paper on roles of gender in the NPT.[187] Japan, which has attached importance to such activities, held a discussion meeting with 20 high school students as Youth Communicators for a World without Nuclear Weapons, and Japanese and other countries' officials and experts on disarmament issues (including Australia, Brazil, China, France, Germany, India, Kazakhstan, South Korea, Mexico, the Netherlands, Poland, Russia and South Africa) at the Delegation of Japan to the Conference on Disarmament in August 2018. Japan also hosted the "Group of Eminent Persons for Substantive Advancement of Nuclear Disarmament," and submitted its recommendations as a working paper to the 2018 NPT PrepCom.[188]

Side events held during the NPT PrepCom and the First Committee of the UNGA, where NGOs can participate, are also important elements of the efforts toward civil society cooperation.[189] During the 2018 NPT PrepCom, Austria, Canada, France, Germany, Japan, Kazakhstan, South Korea, Netherlands, Norway, South Africa, Sweden, Switzerland, the United Kingdom, the United States and others hosted such events. And during the 2018 UNGA, Australia, Austria, Brazil, Canada, France, Germany, Japan, Mexico, Netherlands, New Zealand, Nigeria, Sweden and others hosted such events.

Regarding cooperation with civil society, one of the important efforts for governments is to provide more information on nuclear disarmament and non-proliferation matters. Among the countries surveyed in this report, the following set up a section or sections on disarmament and non-proliferation on their official homepages (in English) and posted enlightening information: Australia, Austria, Belgium, Canada, China, France, Germany, Japan, New Zealand, Sweden, Switzerland, the United Kingdom and the United States.

Finally, a few countries started to legislate "divestment" against organizations or companies involved in producing nuclear weapons. According to the ICAN annual report published in March 2018, 329 banks, insurance companies, pension funds and asset managers from 24 countries that invest significantly in the top 20 nuclear weapon producers (located

[186] See the *Hiroshima Report 2018*.

[187] NPT/CONF.2020/PC.II/WP.38, April 24, 2018.

[188] NPT/CONF.2020/PC.II/WP.37, April 20, 2018.

[189] At the 2018 NPT PrepCom, the Hiroshima Prefectural Government hosted a side event, titled "Identifying concrete steps to move forward nuclear disarmament," in which the Hiroshima Governor, as well as several experts, participated as panelists.

in France, India, the Netherlands, the United Kingdom and the United States[190]) from January 2014 through October 2017, and in total, more than $ 525 billion was made available to the nuclear weapon producing companies.[191] The report also profiles 23 financial institutions that have adopted, implemented and published a policy that comprehensively prevents any financial involvement in nuclear weapon producing companies.[192] Besides, Switzerland and Luxembourg enacted national laws that restrict financing for nuclear weapons production. Norwegian and Swedish state-owned pension funds do not invest in companies deemed to be involved in developing and producing nuclear weapons.[193]

(13) Hiroshima and Nagasaki Peace Memorial Ceremonies

On August 6, 2018, the Hiroshima Peace Memorial Ceremony was held in Hiroshima. Representatives from 85 countries and the EU, along with Japan, participated, including:

- Ambassadorial-level — Australia, Austria, Belgium, Egypt, France, India, Indonesia, Iran, Israel, Kazakhstan, Mexico, New Zealand, Nigeria, Pakistan, Poland, South Africa, Switzerland, Syria, Turkey, the United Kingdom and the United States
- Non-Ambassadorial-level — Brazil, Canada, Germany, South Korea, the Netherlands, Norway, and Russia (Note: underline added to denote countries whose ambassadorial-level representatives have attended the ceremony in the past three years)
- Not attending —Chile, China, the Philippines, Saudi Arabia, Sweden, the UAE, and North Korea (Note: underline added to denote countries whose representatives have attended the ceremony at least once in the past three years)

As for the Nagasaki Peace Memorial Ceremony on August 9, 2018, UN Secretary-General Guterres and representatives from 71 countries, including followings, participated:

- Ambassadorial-level—Australia, Chile, France, Egypt, Germany, Indonesia, Kazakhstan, Mexico, Nigeria, Norway, Pakistan, Philippines, Poland, South Africa, the United Kingdom, and the United States
- Non-Ambassadorial-level—Austria, Brazil, China, India, Israel, Korea, the Netherlands, Russia, and Sweden

[190] As for other nuclear possessors, government agencies directly carry out most of the maintenance and modernization of their nuclear forces.

[191] See IKV Pax Christi and ICAN, "Don't Bank on the Bomb: A Global Report on the Financing of Nuclear Weapons Producers—2018," March 2018, pp. 6-7. The report annotates that it does neither list every single investment into the companies listed as part of the nuclear weapon industry nor include investments made by governments, universities, or churches, only financial institutions. (Ibid., p. 10.)

[192] Ibid., p. 7.

[193] Ibid.

- Not attending—Belgium, Canada, Iran, North Korea, New Zealand, Saudi Arabia, Switzerland, Turkey, and the UAE

At various fora, Japan has proposed that the world's political leaders visit Hiroshima and Nagasaki, to witness the humanitarian consequences of nuclear weapons with their own eyes. In 2018, the following leaders visited Hiroshima: Prime Minister of Lithuania, and Presidents of Tajikistan and Sri Lanka.[194] In May, Chile's President Verónica Michelle Bachelet Jeria visited Nagasaki.

[194] See the Hiroshima City's homepage, http://www.city.hiroshima.lg.jp/www/contents/1416289898775/index.html.

Column 5

Toward the 2020 NPT Review Conference and Beyond

Joan Rohlfing

Next year, at the 2020 Review Conference of the Treaty on the Nonproliferation of Nuclear Weapons (NPT), the world will mark the Treaty's 50th Anniversary – a major milestone in the history of one of the world's most successful and universal accords. However, instead of a celebratory atmosphere as we approach 2020, there is growing frustration, friction and even alarm among states about the potential collapse of the nuclear order so painstakingly cultivated by the Treaty and its signatories over decades. How did we reach this precarious position and how can we move to safer ground?

Two significant drivers have contributed to the current negative political context: a growing divide between nuclear weapon states (NWS) and non-nuclear weapon states (NNWS) over the slow pace of progress on nuclear disarmament; and, relatedly, a dangerously deteriorated political relationship among the nuclear weapon states. Of these two trends, the US-Russia relationship is increasingly threatening the success of the Treaty. Both countries have ended the 50-year dialogue on arms control treaties and procedures for managing nuclear risks. Even more troubling, the US and Russia have both signaled their intent to end participation in the Intermediate Nuclear Forces Treaty (INF) Treaty, and to date, they have not agreed to extend or replace the last remaining nuclear Treaty between them: the New START Treaty. If no action is taken by February 2021, the US and Russia will return to the unregulated nuclear arms competition of the 1950's and 60's.

Against this troubling backdrop, what can be done?

As the 2020 NPT Review Conference approaches, a joint effort among nations can strengthen and revitalize the Treaty and the essential bargain at its core. Work on two fronts is needed: a recommitment from the US and Russia to the process of reducing nuclear weapons and the risks they pose; and demonstrable progress by *all* states on concrete measures toward disarmament.

The United States and Russia must reaffirm their commitment to all three of the NPT's goals, in particular, disarmament. Announcing the extension of the New START Treaty, as well as the resumption of negotiations for a successor agreement would be an important first step. Both states also should declare that "a nuclear war can never be won, and must never be fought"—echoing the Cold War statement from President Reagan and Mikhail Gorbachev. These actions together would send an important signal of their commitment to the NPT at a critical moment and would begin to rebuild important communication channels.

Second, all states must work toward achieving demonstrable progress on steps toward disarmament. It's time for actions, not just words. There are several areas where joint work among states can move us closer to the ultimate goals of the NPT:

- *No First Use*: The NWS should work to reduce the role of nuclear weapons in their security policies by adopting "No First Use" policies. The ongoing dialogue among P-5 states should explore this issue jointly. In addition, the P-5 should engage in a regular dialogue with NNWS to facilitate better understanding about their nuclear use policies.
- *Moving toward "basecamp"*: NPT states should create a process for defining a roadmap to "basecamp" – an achievable and safer staging ground from which the final steps to disarmament can be reached. Basecamp could consist of a set of agreed principles that all nuclear-armed states would implement, including minimum deterrence, no-first-use policies, and force postures and readiness levels that allow for more decision time for leaders.
- *Verification*: Progress on developing verification procedures for a disarmed world is continuing through both the International Partnership for Nuclear Disarmament Verification (IPNDV) and the UN Group of Government Experts (GGE). The work of these two groups has been a bright spot on an otherwise clouded horizon. States should redouble their efforts on both fronts and should begin thinking about how to institutionalize disarmament verification over time.

- *Strengthening Control of Fissile Materials*: In order to achieve a disarmed world, it will be necessary to count, track, and secure all fissile materials in a way that creates confidence that none of it can be diverted to a weapons program. This will require more transparency, safeguards, and verification than currently exists, as well as, inevitably, a stronger legal structure -- including a Fissile Material Cutoff Treaty (FMCT). As a next step, states should set up subsidiary bodies within the Conference on Disarmament to continue to find a path forward on FMCT negotiations and to explore what actions can be taken on a voluntary basis by states to improve transparency, safeguards, and security of these materials in the interim.
- Finally, all states should seek to create more mechanisms for regular engagement and interactive dialogue between NWS and NNWS. Sharing perspectives and information is key for rebuilding a sense of shared understanding and purpose.

Actions across each of these fronts would help rebuild a sense of momentum, as well as trust and confidence between NPT states--in turn helping to create the positive political context essential for progress. As we approach the NPT's 50th anniversary, let's work together to ensure that the Treaty can see us through the next half century. Our collective security demands no less.

Ms. Joan Rohlfing

President and Chief Operating Officer, Nuclear Threat Initiative (NTI)

Column 6

Towards the 2020 NPT review conference

Anton Khlopkov

It has been nearly a year since my last column for The Hiroshima Report. The state of nuclear nonproliferation regime has deteriorated further over that period. In May 2018, Washington announced its pullout from the Joint Comprehensive Plan of Action (JCPOA) on resolving the situation over the Iranian nuclear program. The so called Iran deal was the greatest nuclear nonproliferation regime achievement in the past more than 20 years. Then in February 2019, the United States also announced its withdrawal from the Intermediate Nuclear Forces (INF) Treaty – which, along with the New START Treaty, is a central element of the entire arms control architecture.

Meanwhile, Washington continues to evade dialogue on the future of the New START Treaty, which expires on February 5, 2021. Suffice is to say that the latest Russian-US meeting of the Strategic Stability Talks took place almost 18 months ago, in September 2017. At a meeting of the P5 nations' deputy foreign ministers held in late January 2019 in Beijing, the parties failed to agree a joint statement, demonstrating how great their differences have become. All of this makes the nuclear nonproliferation regime all the more vulnerable to the challenges it has been facing in recent years.

In these circumstances, it will clearly take a special effort to make sure that the results of the upcoming 2020 NPT Review Conference, to be held in April-May 2020 in New York, can slow down – and ideally reverse – the negative nuclear nonproliferation trends, and strengthen the nonproliferation regime. What exactly should be done?

First, all the steps being taken by the parties involved should be based on the principle of "do no harm"; in other words, we need to preserve and safeguard the arrangements that are already in place. Otherwise, there can be no sustainable positive dynamics in this area. One of the top priorities in that context will be to extend the New START Treaty for another five years; the text of the treaty itself specifically provides for such an option.

Second, we need to make use of the new opportunities to make progress on regional nonproliferation issues. The second summit between President Trump and Chairman Kim Jong Un, scheduled for February 2019, can lay the ground for further progress in de-escalating tensions on the Korean peninsula, and thereby make another step towards an eventual denuclearization. Obviously, there is no quick fix to this problem – but it will be important to leverage the opportunities that will hopefully be opened up by the USA-DPRK summit in Vietnam.

In November 2019, a Conference on Establishing the Middle East weapons of mass destruction-free zone will be held in New York. The event will generate a momentum for progress on the Middle East, which has been one of the most complex NPT issues since the treaty's indefinite extension in 1995. To that end, it will be important to ensure the participation of all Middle Eastern states, including those that remain outside the NPT, as well as of the P5 states (which should make their own contribution to the success of the conference).

Third, regular dialogue should resume between the P5 nations to lay the ground for renewed joint efforts ahead of the 2020 NPT Review Conference. Such joint efforts were taken for granted for many decades – and incidentally, they were instrumental for the indefinite extension of the NPT in 1995. But they ground to a halt in 2015, when the United States and the UK blocked the adoption of the Final Document.

Fourth, the nations that remain outside the NPT must demonstrate a responsible policy and avoid inflicting any damage on the existing nuclear nonproliferation mechanisms and arrangements. They should also send their delegations to take part in the 2020 NPT Review Conference as observers. Only Israel made use of such an option in 2015.

Fifth and final, all the nations that will send their delegations to New York in April-May 2020 must desist from using the NPT Review Conference as a venue for settling political scores. Only a pragmatic a depoliticized joint diplomatic effort involving all states will enable them to achieve the desired result: namely, to slow down or reverse the negative trends in the nuclear nonproliferation regime, which is the cornerstone of the international security system. A

collapse of that regime would bring our entire civilization to the brink of a nuclear catastrophe.

Mr. Anton Khlopkov

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Chapter 2. Nuclear Non-Proliferation[1]

(1) Acceptance and Compliance with Nuclear Non-Proliferation Obligations

A) Accession to the NPT

The Nuclear Non-Proliferation Treaty (NPT) has 191 adherents (including North Korea, the Holy See and Palestine). Among the current 193 United Nations (UN) Member States, those remaining outside the NPT are: India and Pakistan, both of which tested and declared having nuclear weapons in 1998; Israel, which is widely believed to possess them; and South Sudan, which declared its independence and joined the United Nations in July 2011, and does not possess any nuclear weapons; and, arguably, North Korea. North Korea declared its withdrawal from the NPT in 2003, but there is no agreement among the states parties on North Korea's official status. It has refused to return to the Treaty despite UN Security Council resolutions (UNSCRs) demanding that it do so at an early date.

With the NPT celebrating the 50th anniversary of opening for signature, the three depositary states (Russia, the United Kingdom and the United States) issued a joint statement, in which they reaffirmed the significance of the NPT in nuclear disarmament and non-proliferation.[2]

B) Compliance with Articles I and II of the NPT and the UNSC resolutions on non-proliferation

North Korea

Since the NPT entered into force, no case of non-compliance with Articles I and II of the Treaty has been officially reported by the United Nations or any other international organization.[3] However, if North Korea's withdrawal is not interpreted as legally valid or if it acquired nuclear weapons before announcing its withdrawal from the NPT, such acquisition of nuclear weapons would constitute non-

[1] This chapter is written by Hirofumi Tosaki.

[2] "Joint Statement by the Foreign Ministers of the Depositary Governments for the Treaty on the Non-Proliferation of Nuclear Weapons," U.S. Department of State, 28 June, 2018, https://www.state.gov/r/pa/prs/ps/2018/06/283593.htm.

[3] No international body is explicitly mandated with a responsibility for assessing compliance with these articles, apart from the IAEA's safeguards verification mandate.

compliance with Article II. The U.S. Department of State clearly stated in its 2017 report, titled "Adherence to and Compliance with Arms Control, Nonproliferation, and Disarmament Agreements and Commitments," that North Korea was in violation of its obligations under Articles II and III of the NPT and in non-compliance with its International Atomic Energy Agency (IAEA) Safeguards Agreement at the time it announced its withdrawal from the NPT in 2003.[4]

UNSCR 1787, adopted in October 2006, stipulates that:

> [T]he DPRK shall abandon all nuclear weapons and existing nuclear programmes in a complete, verifiable and irreversible manner, shall act strictly in accordance with the obligations applicable to parties under the Treaty on the Non-Proliferation of Nuclear Weapons and the terms and conditions of its Safeguards Agreement (IAEA INFCIRC/403) and shall provide the IAEA transparency measures extending beyond these requirements, including such access to individuals, documentation, equipments and facilities as may be required and deemed necessary by the IAEA.[5]

The Security Council also decided that North Korea "shall abandon all other existing weapons of mass destruction and ballistic missile programme in a complete, verifiable and irreversible manner." In defiance, North Korea has failed to respond to the UN Security Council's decisions, and has continued nuclear weapon and ballistic missile-related activities, including its sixth nuclear test in September 2017.

However, North Korea suddenly initiated a diplomatic offensive in 2018. In his New Year address of January 2018, while flaunting possession of a claimed nuclear deterrent and urging cancelation of U.S.-South Korean joint military exercises, Kim Jong-un, Chairman of the Workers' Party of Korea, stated: "The north and the south should desist from doing anything that might aggravate the situation, and they should make concerted efforts to defuse military tension and create a peaceful environment. The south Korean authorities should respond positively to our sincere efforts for a detente, instead of inducing the exacerbation of the situation by joining the United States in its reckless moves for a north-targeted nuclear war that threatens the destiny of the entire nation as well as peace and stability on this land."[6] Responding positively, South Korea repeated an offer to hold bilateral high-level talks and announced that the United States and South Korea agreed to postpone their joint military exercises until after the Pyeongchang Winter Olympics and Paralympic Games in February-March 2018. South-North high-level

[4] U.S. Department of State, "Adherence to and Compliance with Arms Control, Nonproliferation, and Disarmament Agreements and Commitments," April 2017, https://www.state.gov/t/avc/rls/rpt/2017/270330.htm.

[5] S/RES/1718, October 14, 2006. The UN Security Council Resolution 1874 in June 2009 also demanded that North Korea "immediately comply fully with its obligations under relevant Security Council resolutions, in particular resolution 1718 (2006)."

[6] "Kim Jong Un's 2018 New Year's Address," January 1, 2018, https://www.ncnk.org/node/1427.

talks were subsequently held on January 9, 2018. In a Joint Statement they said that they agreed on: the North's participation in the Pyeongchang Winter Olympics and Paralympic Games; alleviation of the military tension; and resolution of the South-North issues bilaterally. However, North Korea reportedly insisted that it had no intention to discuss nuclear issues with the South.

On April 27, the third inter-Korea summit—the first since October 2007—was held on the South Korean side of the Joint Security Area. In the Panmunjom Declaration adopted at the summit, the two leaders made the following nuclear-related commitments:[7]

- South and North Korea confirmed the common goal of realizing, through complete denuclearization, a nuclear-free Korean Peninsula.
- During this year that marks the 65th anniversary of the Armistice, South and North Korea agreed to actively pursue trilateral meetings involving the two Koreas and the United States, or quadrilateral meetings involving the two Koreas, the United States and China with a view to declaring an end to the War, turning the armistice into a peace treaty, and establishing a permanent and solid peace regime.
- South and North Korea affirmed the principle of determining the destiny of the Korean nation on their own accord and agreed to bring forth the watershed moment for the improvement of inter-Korean relations by fully implementing all existing agreements and declarations adopted between the two sides thus far.

Following this, on June 12, the first U.S.-North Korean summit meeting was convened in Singapore by President Trump and Chairman Kim Jong-un. According to the joint statement signed by them after the meeting, "President Trump and Chairman Kim Jong Un conducted a comprehensive, in-depth, and sincere exchange of opinions on the issues related to the establishment of new U.S.-DPRK relations and the building of a lasting and robust peace regime on the Korean Peninsula. President Trump committed to provide security guarantees to the DPRK, and Chairman Kim Jong Un reaffirmed his firm and unwavering commitment to complete denuclearization of the Korean Peninsula."[8] Furthermore, they agreed:

- The United States and the DPRK commit to establish new U.S.-DPRK relations in accordance with the desire of the peoples of the two countries for peace and prosperity;
- The United States and the DPRK will join their efforts to build a lasting and stable peace regime on the Korean Peninsula;
- Reaffirming the April 27, 2018 Panmunjom Declaration, the DPRK

[7] "Panmunjom Declaration for Peace, Prosperity and Unification of the Korean Peninsula," April 27, 2018.

[8] "Joint Statement of President Donald J. Trump of the United States of America and Chairman Kim Jong Un of the Democratic People's Republic of Korea at the Singapore Summit," June 12, 2018, https://www.whitehouse.gov/briefings-statements/joint-statement-president-donald-j-trump-united-states-america-chairman-kim-jong-un-democratic-peoples-republic-korea-singapore-summit/.

commits to work toward complete denuclearization of the Korean Peninsula; and

- The United States and the DPRK commit to recovering POW/MIA remains, including the immediate repatriation of those already identified.

The inter-Korean relationship has steadily improved. After the April summit meeting, the two leaders met again in May and September, and agreed the Pyongyang Declaration at the summit meeting on September 18-19. The Pyongyang Declaration adopted on this occasion stated "[t]he two sides shared the view that the Korean Peninsula must be turned into a land of peace free from nuclear weapons and nuclear threats, and that substantial progress toward this end must be made in a prompt manner," and stipulated, inter alia, the following measures:[9]

- [T]he North will permanently dismantle the Dongchang-ri missile engine test site and launch platform under the observation of experts from relevant countries.
- The North expressed its willingness to continue to take additional measures, such as the permanent dismantlement of the nuclear facilities in Yongbyon, as the United States takes corresponding measures in accordance with the spirit of the June 12 U.S.-DPRK Joint Statement.
- The two sides agreed to cooperate closely in the process of pursuing complete denuclearization of the Korean Peninsula.

In April 2018, North Korea announced that it no longer needed to conduct nuclear tests or test launches of intermediate and intercontinental range ballistic missiles because it had completed the development of nuclear weapons. Accordingly, it would close down its nuclear test site. The next month, in the presence of select foreign journalists but no international inspectors, the North blew up tunnels at its nuclear test site at Punggye-ri in May. It later began dismantling key facilities located at the Sohae Satellite Launching Station,[10] tearing down the steel base structure and apparently removing fuel and oxidizer tanks from dismantled bunkers.[11] This was done without international observers, although activity could be observed via overhead imagery. According to the U.S. Department of State, during a meeting

[9] "Pyongyang Declaration," the Inter-Korean Summit Meeting in Pyongyang, September 18-20, 2018, https://www.koreatimes.co.kr/www/nation/2018/09/103_255848.html.

[10] Joseph S. Bermudez Jr., "North Korea Begins Dismantling Key Facilities at the Sohae Satellite Launching Station," *38 North*, July 23, 2018, https://www.38north.org/2018/07/sohae072318/.

[11] Joseph S. Bermudez Jr., "More Progress on Dismantling Facilities at the Sohae Satellite Launching Station," *38 North*, August 7, 2018, https://www.38north.org/2018/08/sohae080718/. It is argued that "Since these facilities are believed to have played an important role in the development of technologies for the North's intercontinental ballistic missile program, these efforts represent a significant confidence building measure on the part of North Korea." (Bermudez Jr., "North Korea Begins Dismantling Key Facilities.") However, other experts doubt its significance since North Korea may dismantle sites or facilities which are no longer important for its nuclear and missile developments or could rebuild them in a relatively short period. See, for example, Ankit Panda, "US Intelligence: North Korean Engine Dismantlement at Sohae Reversible 'Within Months,'" *Diplomat*, July 25, 2018, https://thediplomat.com/2018/07/us-intelligence-north-korean-engine-dismantlement-at-sohae-reversible-within-months/.

with U.S. Secretary of State Pompeo in October, Chairman Kim indicated his intention to invite inspectors to visit the Punggye-ri nuclear test site to confirm that it has been irreversibly dismantled.[12] While the announced missile launch moratorium pertained to longer-range systems, North Korea did not conduct test launches of missiles of any range in 2018.

The United States responded positively to these steps. Ata press conference after the U.S.-North Korean summit meeting in June, President Trump announced the suspension of U.S.-South Korean joint military exercises. Accordingly, planned joint exercises, including the Ulchi Freedom Guardian in August were cancelled. U.S. Secretary of Defense Jim Mattis said in November, "Foal Eagle [conducted in Spring 2019] is being reorganized a bit to keep it at a level that will not be harmful to diplomacy,"[13] implying that its scale would be reduced. In addition, the United States stopped demanding the "complete verifiable and irreversible denuclearization (CVID)" by North Korea, a term that North Korea has opposed, and changed the terminology to "final and fully verified denuclearization (FFVD)."

However, further progress towards de-nuclearization of North Korea was not seen during 2018. For instance, Pyongyang refused to accept the U.S. proposals that North Korea hand over 60 to 70 percent of its nuclear warheads within six to eight months, to the United States or a third party for removal from North Korea.[14]

Rather, North Korea blamed the U.S. attitudes as follows:

> The State Department of the U.S. in charge of negotiations with the DPRK is nowadays claiming that it will not lift sanctions before the denuclearization and that the escalation of sanctions is the way to enhance the negotiating power. The U.S. Department of Treasury, too, claims that it has no plan to lift the sanctions against the DPRK and will further escalate the sanctions. As if to prove the facts, the U.S. Congress is drawing up bills related with the escalation of sanctions against the DPRK. And American media and experts are building up an opinion for sanctions, contending that the Trump administration reconfirmed the keynote of "denuclearization first, lifting of sanctions next" and it will turn to the policy of "maximum pressure" unless north Korea takes denuclearization step.[15]

In addition, the North's Foreign Minister Ri Yong Ho reportedly said at the meeting in August with the Speaker of the Iranian Parliament Ali Larijani, "Dealing with Americans is difficult, and as our main goal is total disarmament of

[12] Office of the Spokesperson, "Secretary Pompeo's Meetings in Pyongyang, Democratic People's Republic of Korea," U.S. Department of State, October 7, 2018, https://www.state.gov/r/pa/prs/ps/2018/10/286482.htm.

[13] Corey Dickstein, "US, South Korea to Scale Back Foal Eagle Exercise This Spring," *Stars and Stripes*, November 21 2018, https://www.stripes.com/news/us/us-south-korea-to-scale-back-foal-eagle-exercise-this-spring-1.557571.

[14] Alex Ward, "Pompeo Told North Korea to Cut Its Nuclear Arsenal by 60 to 70 Percent," *Vox*, August 8, 2018, https://www.vox.com/2018/8/8/17663746/pompeo-north-korea-nuclear-60-70.

[15] "U.S. Will Get Nothing with Its "Pressure Diplomacy": Rodong Sinmun," *KCNA*, August 6, 2018, http://www.kcna.co.jp/item/2018/201808/news06/20180806-07ee.html.

the whole Korean Peninsula, it is necessary that the Americans also abide by their commitments but they refuse to do so…Although North Korea has agreed on disarmament to deliver on its commitments in negotiations with US, we will preserve our nuclear science as we know that the Americans will not abandon their hostility toward us."[16]

Furthermore, the North Korean state-run Korean Central News Agency wrote: "When we refer to the 'denuclearization of the Korean Peninsula,' it means the removal of all sources of nuclear threat not only from the North and the South but also from all neighboring areas targeting the peninsula," the official Korean Central News Agency said in a published commentary on Thursday. "The denuclearization of the Korean Peninsula should be defined as 'completely eliminating the U.S. nuclear threat to Korea' before it can eliminate our nuclear deterrent."[17] Analysts interpreted this to mean an end to the U.S. "nuclear umbrella" extended over South Korea and Japan. North Korea's attachment of this conditionality raised doubts about its intention to denuclearize.

Iran

The E3/EU+3 (France, Germany and the United Kingdom/European Union plus China, Russia and the United States) and Iran agreed the Joint Comprehensive Plan of Action (JCPOA) on July 14, 2015 in Vienna.[18] Since then, the IAEA has submitted quarterly reports to the Board of Governors confirming Iran's adherence to its nuclear obligations under the JCPOA. The main points of the IAEA August 2018 report are:[19]

- At the Fuel Enrichment Plant (FEP) at Natanz, there have been no more than 5060 IR-1 centrifuges;
- Iran's total enriched uranium stockpile has not exceeded 300 kg of UF6 enriched up to 3.67% U-235 (or the equivalent in different chemical forms). The quantity of 300 kg of UF6 corresponds to 202.8 kg of uranium;
- Iran has not enriched uranium above 3.67% U-235;
- Iran's stock of heavy water was 122.9 metric tonnes. Throughout the reporting period, Iran had no more than 130 metric tonnes of heavy water;
- Iran has continued to permit the Agency to use on-line enrichment monitors and electronic seals which communicate their status within nuclear sites to Agency inspectors, and to facilitate the automated collection of Agency measurement recordings registered by installed measurement devices;

[16] Oliver Hotham, "N. Korea Will Retain "Nuclear Science" Following Disarmament: Foreign Minister," *NK News*, August 10, 2018, https://www.nknews.org/2018/08/n-korea-will-retain-nuclear-science-following-disarmament-foreign-minister/.

[17] "North Korea Media Says Denuclearization Includes Ending 'U.S. Nuclear Threat,'" *Reuters*, December 20, 2018, https://ca.reuters.com/article/topNews/idCAKCN1OJ0J1-OCATP.

[18] "Joint Comprehensive Plan of Action," Vienna, July 14, 2015. JCPOA is posted on the U.S. State Department's website (http://www.state.gov/e/eb/tfs/spi/iran/jcpoa/).

[19] GOV/2018/33, August 30, 2018.

- Iran has continued to permit the Agency to monitor…that all uranium ore concentrate (UOC) produced in Iran or obtained from any other source is transferred to the Uranium Conversion Facility (UCF) at Esfahan;
- Iran continues to provisionally apply the Additional Protocol to its Safeguards Agreement in accordance with Article 17(b) of the Additional Protocol, pending its entry into force. The Agency has continued to evaluate Iran's declarations under the Additional Protocol, and has conducted complementary accesses under the Additional Protocol to all the sites and locations in Iran which it needed to visit.
- The Agency's verification and monitoring of Iran's nuclear-related commitments set out in Sections D, E, S and T of Annex I continues. (Section T prohibited certain activities relevant to the development of nuclear weapons, but the JCPOA did not say how these prohibitions were to be verified.)

On the other hand, statements by the U.S. new administration raised concerns about the future of the JCPOA. President Trump criticized the agreement even before his inauguration. In March 2016, he said, "My number one priority is to dismantle the disastrous deal with Iran." In January 2018, he again threatened to withdraw from the JCPOA unless the Congress adopted legislation that included "four critical components."[20] He said:

- "First, it must demand that Iran allow immediate inspections at all sites requested by international inspectors.
- Second, it must ensure that Iran never even comes close to possessing a nuclear weapon.
- Third, unlike the nuclear deal, these provisions must have no expiration date. My policy is to deny Iran all paths to a nuclear weapon—not just for ten years, but forever. If Iran does not comply with any of these provisions, American nuclear sanctions would automatically resume.
- Fourth, the legislation must explicitly state in United States law—for the first time—that long-range missile and nuclear weapons programs are inseparable, and that Iran's development and testing of missiles should be subject to severe sanctions."

The Congress did not pass such legislation, waiting instead for the U.S. negotiations with France, Germany and the United Kingdom (the "E3") to find ways to address Trump's demands. Although the negotiators came close to reaching agreement on a way forward, President Trump on May 8, announced withdrawal from the Iran nuclear deal. He stated that: "we will be working with our allies to find a real, comprehensive, and lasting solution to the Iranian nuclear threat. This will include efforts to eliminate the threat of Iran's ballistic missile program; to stop its terrorist activities worldwide; and to block its menacing activity across the Middle East. In the

[20] Donald Trump, "Statement by the President on the Iran Nuclear Deal," January 12, 2018, https://www.whitehouse.gov/briefings-statements/statement-president-iran-nuclear-deal/.

meantime, powerful sanctions will go into full effect."[21] On the same day, the U.S. Department of Treasury's Office of Foreign Assets Control (OFAC) announced that sanctions against Iran, whose targets included critical sectors of Iran's economy, such as the energy, shipping and shipbuilding, and financial sectors, would be re-imposed subject to certain 90-day and 180-day wind-down periods.[22] In accordance with this decision, the United States re-imposed a ban on trade with Iran in automobiles, gold, steel and other metal-related products effective on August 7, and sanctions on the energy sector effective on November 5. These measures include secondary sanctions against countries trading with Iran.

Two weeks after President Trump's announcement on withdrawing from the JCPOA, Secretary of State Pompeo stated that the United States would negotiate with Iran on a new deal if the following 12 demands were met:[23]

1. Iran must declare to the IAEA a full account of the prior military dimensions of its nuclear program, and permanently and verifiably abandon such work in perpetuity.
2. Iran must stop enrichment and never pursue plutonium reprocessing. This includes closing its heavy water reactor.
3. Iran must also provide the IAEA with unqualified access to all sites throughout the entire country.
4. Iran must end its proliferation of ballistic missiles and halt further launching or development of nuclear-capable missile systems.
5. Iran must release all U.S. citizens, as well as citizens of our partners and allies, each of them detained on spurious charges.
6. Iran must end support to Middle East terrorist groups, including Lebanese Hizballah, Hamas, and the Palestinian Islamic Jihad.
7. Iran must respect the sovereignty of the Iraqi Government and permit the disarming, demobilization, and reintegration of Shia militias.
8. Iran must also end its military support for the Houthi militia and work towards a peaceful political settlement in Yemen.
9. Iran must withdraw all forces under Iranian command throughout the entirety of Syria.
10. Iran, too, must end support for the Taliban and other terrorists in Afghanistan and the region, and cease harboring senior al-Qaida leaders.
11. Iran, too, must end the Islamic Revolutionary Guard (IRG) Qods Force's support for terrorists and militant partners around the world.
12. Iran must end its threatening behavior against its neighbors – many of whom are U.S. allies. This certainly includes its

[21] "Remarks by President Trump on the Joint Comprehensive Plan of Action," May 8, 2018, https://www.whitehouse.gov/briefings-statements/remarks-president-trump-joint-comprehensive-plan-action/.

[22] See, for instance, "Statement by Secretary Steven T. Mnuchin on Iran Decision," Department of Treasury, May 8, 2018, https://home.treasury.gov/news/press-releases/sm0382.

[23] Mike Pompeo, U.S. Secretary of State, "After the Deal: A New Iran Strategy," The Heritage Foundation, Washington, DC, May 21, 2018, https://www.state.gov/secretary/remarks/2018/05/282301.htm.

threats to destroy Israel, and its firing of missiles into Saudi Arabia and the United Arab Emirates. It also includes threats to international shipping and destructive cyberattacks.

In a October 15 journal article, Pompeo added a 13th demand: for Iran to make substantial improvements on its human-rights record.[24]

Iranian President Rouhani's immediate response to Trump's withdrawal was to keep patient, though stating that: "[I]f necessary, we can begin our industrial enrichment without any limitations." He added that "Until implementation of this decision, we will wait for some weeks and will talk with our friends and allies and other signatories of the nuclear deal, who signed it and who will remain loyal to it. Everything depends on our national interests."[25] At the same time, Iran emphasized that maintaining the JCPOA would need a clear assurance of Iran's rights relating to oil export, banking, investment and insurance, especially by the E3.[26] In addition, Supreme leader Ayatollah Khamenei clarified seven conditions to stay with the JCPOA on May 24,[27] and Foreign Minister Zarif added 15 demands to the United States.[28]

Leaders of France, Germany and the United Kingdom released a joint statement on the day of the U.S. announcement of the withdrawal, and stated that they would work on maintaining the JCPOA.[29] In this regard, and as a measure for preventing Iran's withdrawal, the European countries launched a process of updating the 1996 Blocking Statute, aiming to prevent and protect European entities and legitimate commerce with Iran from compliance with

[24] Michael R. Pompeo, "Confronting Iran; The Trump Administration's Strategy," *Foreign Affairs*, October 15, 2018, https://www.state.gov/secretary/remarks/2018/10/286751.htm.

[25] Nasser Karimi and Amir Vahdat, "Iran President: Uranium Enrichment May Resume If Deal Fails," *Associated Press*, May 8, 2018, https://www.apnews.com/b9487a3c9dd64fdd8a5fed11b86d6717.

[26] "Without Definite Guarantee of 3 EU Countries, We Won't Stick with JCPOA," *Khamenei.ir*, May 9, 2018, http://english.khamenei.ir/news/5654/Without-definite-guarantee-of-3-EU-countries-we-won-t-stick; Patrick Wintour and Julian Borger, "EU Rushes to Arrange Crisis Meeting with Iran over Nuclear Deal," *Guardian*, May 9, 2018, https://www.theguardian.com/world/2018/may/09/eu-moves-to-protect-european-firms-from-us-sanctions-on-iran.

[27] "Ayatollah Khamenei Sets Seven Conditions for Europe to Save Nuclear Deal," *Teheran Times*, May 25, 2018, https://www.tehrantimes.com/news/423907/Ayatollah-Khamenei-sets-seven-conditions-for-Europe-to-save-nuclear.

[28] "Zarif's Response to Pompeo's 12 Demands," *Iran Daily*, June 20, 2018, http://www.iran-daily.com/News/217019.html.

[29] "Joint Statement from Prime Minister May, Chancellor Merkel and President Macron following President Trump's Statement on Iran," May 8, 2018, https://www.gov.uk/government/news/joint-statement-from-prime-minister-may-chancellor-merkel-and-president-macron-following-president-trumps-statement-on-iran.

U.S. extra-territorial sanctions.[30] The update entered into force on August 7.[31] In addition, the JCPOA participants, except the United States, agreed at a ministerial meeting on September 24 that they would continue to work on building a framework for maintaining trade with Iran including crude oil. According to their joint statement, "the participants welcomed practical proposals to maintain and develop payment channels, notably the initiative to establish a Special Purpose Vehicle, to facilitate payments related to Iran's exports (including oil) and imports, which will assist and reassure economic operators pursuing legitimate business with Iran."[32]

While the United States reiterated that it had an intention to negotiate a new agreement with Iran and reportedly made several offers to talk,[33] Iran clearly rejected the U.S. proposals. In the meantime, at a summit-level meeting of the UN Security Council on non-proliferation of weapons of mass destruction (WMD) over which he presided, President Trump harshly criticized the JCPOA, whereas the leaders of the other member states insisted on the importance and necessity of maintaining the agreement.

Despite the U.S. withdrawing from the JCPOA and reimposing sanctions, Iran did not follow suit but continued to comply with the agreement in 2018. At the same time, however, Iran warned against the U.S. activities. For example, Iran notified the IAEA in a letter of June 2018 that it was making arrangements for production of UF4 and UF6 gases as well as rotors for centrifuges.[34] In September, it was reported that Iran completed a facility to build advanced centrifuges.[35] Furthermore, Iran also informed the IAEA in a letter dated January 6 that Iran decided to construct naval nuclear propulsion in future.[36]

Separately, Israeli President Benjamin Netanyahu on April 30 revealed 55,000 pages of dated documents about nuclear weapons

[30] European Commission, "Updated Blocking Statute in Support of Iran Nuclear Deal," https://ec.europa.eu/fpi/what-we-do/updated-blocking-statute-support-iran-nuclear-deal_en.

[31] Ibid. It was reported that despite such efforts, some of the European companies operating in the United States suspended transactions, investments and operations with Iran. Ted Regencia, "What Sanctions Will the US Reimpose against Iran on Tuesday?" *Al Jazeera*, August 6, 2018, https://www.aljazeera.com/news/2018/08/sanctions-iran-snap-tuesday-180804193910915.html.

[32] "Implementation of the Joint Comprehensive Plan of Action: Joint Ministerial Statement," September 24, 2018, https://eeas.europa.eu/headquarters/headquarters-homepage/51036/implementation-joint-comprehensive-plan-action-joint-ministerial-statement_en.

[33] "Brian Hook's Written Remarks," Hudson Institute, September 19, 2018, https://www.hudson.org/research/14577-brian-hook-s-written-remarks; "Iran Dismisses U.S. Offer of Talks, Says Washington Broke Last Deal," *Reuters*, September 20, 2018, https://www.reuters.com/article/us-iran-nuclear-zarif-usa/iran-dismisses-u-s-offer-of-talks-says-washington-broke-last-deal-idUSKCN1M01XN.

[34] "Iran Tells UN It Plans to Boost Uranium Enrichment Capacity, *Associated Press*, June 5, 2018, https://globalnews.ca/news/4253294/iran-un-uranium-enrichment-capacity/.

[35] "Iran Completes Facility to Build Centrifuges: Nuclear Chief," *Reuters*, September 10, 2018, https://www.reuters.com/article/us-iran-nuclear-salehi/iran-completes-facility-to-build-centrifuges-nuclear-chief-idUSKCN1LPoRE.

[36] GOV/2018/7, February 22, 2018.

development he said Israeli agents had seized from a warehouse in Tehran that January.[37] Much of the information was in line with documents previously in IAEA possession related to concerns about the development of a nuclear payload for a missile.[38] New information revealed by Netanyahu included that Iran allegedly: intended to build five nuclear warheads, each with an explosive yield of 10 kilotons; obtained explicit weapons-design information from a foreign source and was on the cusp of mastering key bomb-making technologies when the research was ordered halted 15 years ago; measured radiation from a neutron-generating explosive test; conducted experiments in making a form of uranium metal.[39] Iran denied Israel's claims as "laughably absurd."[40]

Withdrawal from the NPT

Although Article X-1 of the NPT contains some guidance on how a state can legitimately withdraw from the treaty, there remains a lack of clarity over some aspects of this process. Concerns have focused on a state choosing to withdraw from the NPT, after first acquiring nuclear weapons in violation of the Treaty. Japan, South Korea and other several Western countries have proposed measures to prevent the right of withdrawal from being abused.

At the 2018 Preparatory Committee (PrepCom) for the 2020 NPT Review Conference (RevCon), the so-called Vienna Group of Ten in its working paper argued that "withdrawal from the Treaty carries inherent risks to non-proliferation efforts and could constitute a threat to international peace and security," and proposed that exercise of the right of withdrawal under Article X of the Treaty be governed by the following principles:[41]

- The right of withdrawal from the NPT can only be exercised in the face of extraordinary events related to the subject matter of the treaty;
- The withdrawing State is still liable for violations of the Treaty perpetrated prior to withdrawal;
- Withdrawal should not affect any right,

[37] "Nuclear Deal: Netanyahu Accuses Iran of Cheating on Agreement," *Guardian*, 30 April 2018, https://www.theguardian.com/world/2018/apr/30/netanyahu-accuses-iran-cheating-nuclear-deal.

[38] Jeffrey Lewis, "Bibi's Infomercial for the Iran Deal," *Foreign Policy*, May 1, 2018, http://foreignpolicy.com/2018/05/01/netanyahus-informercial-for-the-iran-deal/.

[39] Joby Warrick, "Papers Stolen in Daring Israeli Raid on Tehran Archive Reveal Extent of Iran's Past Weapons Research," *Chicago Tribune*, July 15, 2018, https://www.chicagotribune.com/news/nationworld/ct-iran-israel-nuclear-weapons-20180715-story.html. See also David Albright, "What is New in the Iran Nuclear Archive?" Institute for Science and International Security, June 6, 2018, http://isis-online.org/conferences/detail/what-is-new-in-the-iran-nuclear-archive#When:15:26:00Z. Israeli Prime Minister Benjamin Netanyahu told at the UN General Assembly in September that Iran concealed 15 kg radioactive material for nuclear weapons in Tehran, and urged the IAEA for dispatching inspectors immediately. John Irish, and Arshad Mohammed, "Netanyahu, in U.N. Speech, Claims Secret Iranian Nuclear Site," *Reuters*, September 28, 2018, https://www.reuters.com/article/us-un-assembly-israel-iran/israel-accuses-iran-of-concealing-nuclear-material-for-weapons-program-idUSKCN1M72FZ.

[40] "Iran Calls Israel's Reported Theft of Nuclear Trove 'Laughably Absurd,'" *New York Times*, July 18, 2018, https://www.nytimes.com/2018/07/18/world/middleeast/iran-israel-nuclear-denial.html.

[41] NPT/CONF.2020/PC.II/WP.5, March 7, 2018.

obligation or legal situation between the withdrawing State and each of the other States parties created through implementation of the Treaty prior to withdrawal, including those related to IAEA safeguards;

- Every diplomatic effort should be made to persuade the withdrawing State to reconsider its decision;
- All nuclear materials, equipment and technology acquired by a State party under Article IV prior to withdrawal must remain under IAEA safeguards or fallback safeguards even after withdrawal; and
- Nuclear-supplying States should be encouraged to exercise their right to incorporate dismantling and/or return clauses or fallback safeguards in the event of withdrawal into contracts or other arrangements concluded with the withdrawing State, and to adopt standard clauses for this purpose.

Germany stated that it is necessary to "arriv[e] at a common understanding of States parties on how to respond effectively to a State party's withdrawal from the NPT."[42]

At the 2015 NPT Review Conference (RevCon),[43] western countries insisted that withdrawal from the NPT should be made difficult by adding several conditions, while they also acknowledged the right of states parties to withdraw. Among NWS, Chinese and Russian positions on this issue seem more cautious than those of France, the United Kingdom and the United States. Some NNWS, including the Non-Aligned Movement (NAM) countries, argue that there is no need to revise or reinterpret Article X on grounds that withdrawal from the NPT is the right of all state parties.

C) Nuclear-Weapon-Free Zones

Treaties establishing nuclear-weapon-free zones (NWFZs) have entered into force in Latin America (Tlatelolco Treaty), the South Pacific (Rarotonga Treaty), Southeast Asia (Bangkok Treaty), Africa (Pelindaba Treaty), and Central Asia (Central Asian NWFZ Treaty). In addition, Mongolia declared its territory a nuclear-weapon-free zone at the UN General Assembly (UNGA) in 1992, and the UNGA has been adopting a resolution entitled "Mongolia's International Security and Nuclear-Weapon-Free-Status" every two years since 1998, in support of Mongolia's declaration.[44] All the states eligible to join the NWFZs in Latin America, Southeast Asia and Central Asia are parties to the respective NWFZ treaties.

Regarding efforts for establishing a Middle East Zone Free of WMD, the convening of an international conference, agreed at the 2010 NPT RevCon, could not be achieved before the 2015 NPT RevCon. Furthermore, at the latter RevCon, a final document was not adopted due

[42] "Statement by Germany," Cluster II, the 2018 NPT PrepCom, April 27, 2018.

[43] On the arguments and proposals made at the 2015 NPT RevCon by countries surveyed in this report, see the *Hiroshima Report 2016*.

[44] 53/77D, December 4, 1998.

to a lack of consensus on the language regarding that international conference. The NAM in its working paper submitted to the 2018 NPT PrepCom urged the convening of the conference no later than 2020.[45] On the other hand, the United States opposed addressing the Middle Eastern issue in the NPT review cycle, arguing that: the task of creating a zone free of weapons of mass destruction in the Middle East, or in any other region of the world, is fundamentally a regional task which must be pursued by the regional States concerned in a cooperative and pragmatic manner, through direct, inclusive and consensus-based dialogue; that the Middle East faces several principal challenges, including lack of trust among the States of the region, non-compliance in the region, regional security challenges, and lack of political will among the regional States; that the NPT review cycle cannot be the primary mechanism for progress on a Middle East zone free of WMD; and the recommendations on the Middle East contained in the Final Document of the 2010 RevCon can no longer be considered an appropriate basis for action on this issue.

The League of Arab States submitted a draft decision, titled "Convening a conference on a Middle East zone free of nuclear weapons and other weapons of mass destruction," to the First Committee of the UN General Assembly in 2018. In this draft resolution, the co-sponsors requested to, inter alia: entrust to the Secretary-General the convening, no later than 2019 for a duration of one week at United Nations Headquarters, of a conference on the establishment of a Middle East zone free of nuclear weapons and other WMD; and to convene annual sessions of the conference for a duration of one week at United Nations Headquarters until the conference concludes the elaboration of a legally binding treaty establishing a Middle East zone free of nuclear weapons and other WMD.[46] The draft decision was sent to the General Assembly from its First Committee by 103 in favor, 3 against and 71 abstentions, and then adopted at the UNGA by a narrow margin—88 in favor, 4 against (Israel, the United States and others) and 75 abstentions (Australia, Austria, Belgium, Brazil, Canada, France, India, Japan, South Korea, Mexico, Netherlands, New Zealand, Norway, Poland, Sweden, Switzerland, Turkey, the United Kingdom and others).[47]

At past UNGAs from 1980 to 2017, a resolution titled "Establishment of a nuclear-weapon-free zone in the region of the Middle East" was adopted without a vote. However, the resolution in 2018[48] was taken to a vote: Israel and the United States were against, and five countries, including the United Kingdom, abstained. In explaining its decision to vote against this resolution, Israel blamed the Arab League for breaking consensus on the subject by proposing the new resolution calling for a conference in

[45] NPT/CONF.2020/PC.II/WP.16, March 22, 2018.

[46] A/C.1/73/L.22/Rev.1, October 17, 2018.

[47] United Nations, "General Assembly Adopts 16 Texts Recommended by Fifth Committee, Concluding Main Part of Seventy-Third Session," Meeting Coverage, December 22, 2018, https://www.un.org/press/en/2018/ga12117.doc.htm.

[48] A/RES/73/28, December 5, 2018.

2019.[49]

Concerning Northeast Asia and South Asia, while initiatives for establishing NWFZs have been proposed by non-governmental groups in the respective regions, there are few indications that state parties in these regions are taking any serious initiative toward such a goal. One exception is Mongolia, which in its report submitted to the 2015 NPT RevCon expressed a willingness to "[p]lay an active role in promoting the idea of establishing a nuclear weapon-free zone in north-east Asia."[50]

(2) IAEA Safeguards Applied to the NPT NNWS

A) Conclusion of IAEA Safeguards Agreements

Under Article III-1 of the NPT, "[e]ach Non-nuclear-weapon State Party to the Treaty undertakes to accept safeguards as set forth in an agreement to be negotiated and concluded with the International Atomic Energy Agency in accordance with the Statute of the International Atomic Energy Agency and the Agency's safeguards system, for the exclusive purpose of verification of the fulfillment of its obligations assumed under this Treaty with a view to preventing diversion of nuclear energy from peaceful uses to nuclear weapons or other nuclear explosive devices." The basic structure and content of the safeguards agreement are specified in the Comprehensive Safeguards Agreement (CSA), known as INFCIRC/153, which each state negotiates with the IAEA and then signs and ratifies. As of December 2018, 12 NPT NNWS have yet to conclude CSAs with the IAEA.[51]

In accordance with a strengthened safeguards system in place since 1997, an NPT NNWS or any other state may also conclude with the IAEA an Additional Protocol to its safeguards agreement, based on a model document known as INFCIRC/540. As of December 2018, 128 NPT NNWS have ratified Additional Protocols. No additional country ratified them in 2018. Iran started provisional implementation of the Additional Protocol in January 2016, while it has yet to ratify the Protocol.

A state's faithful implementation of the Additional Protocol, along with the CSA, allows the IAEA Secretariat to draw a so-called "broader conclusion" that "all nuclear material in the State has remained in peaceful activities." This conclusion is that the Agency finds no indications of diversion of declared nuclear material from peaceful nuclear activities or any undeclared nuclear material or activities in that country. Subsequently, the IAEA implements so-called "integrated safeguards," which is defined as the "optimized combination of all

[49] Alicia Sanders-Zakre, "UN Body Seeks Mideast WMD-Free-Zone Talks," *Arms Control Today*, Vol. 48, No. 10 (December 2018), https://www.armscontrol.org/act/2018-12/news/un-body-seeks-mideast-wmd-free-zone-talks.

[50] NPT/CONF.2015/8, February 25, 2015.

[51] This number includes Palestine, which acceded to the NPT in 2015. Those 12 countries have little nuclear material, or do not conduct nuclear-related activities.

safeguards measures available to the Agency under [CSAs] and [Additional Protocols], to maximize effectiveness and efficiency within available resources." As of the end of 2017, 65 NNWS have applied integrated safeguards.[52]

The current status of the signature and ratification of the CSAs and the Additional Protocols and the implementation of integrated safeguards by the NPT NNWS studied in this project is presented in the following table. In addition to the IAEA safeguards, EU countries accept safeguards conducted by EURATOM, and Argentina and Brazil conduct mutual inspections under the bilateral Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials (ABACC).

In the resolution, "Strengthening the Effectiveness and Improving the Efficiency of Agency Safeguards" adopted in September 2018, the IAEA General Conference called on all States with unmodified Small Quantity Protocols (SQPs) to either rescind or amend them.[53] As of September 2018, the amended SQPs for 57 countries were entered into force. Among states that have announced an intention to introduce nuclear energy, Saudi Arabia has yet to accept an amended SQP.

B) Compliance with IAEA Safeguards Agreements

The IAEA Annual Report 2017 stated:

> Of the 127 States that had both a CSA and an AP in force the Agency drew the broader conclusion that all nuclear material remained in peaceful activities for 70 States; for the remaining 57 States, as the necessary evaluation regarding the absence of undeclared nuclear material and activities for each of these States remained ongoing, the Agency concluded only that declared nuclear material remained in peaceful activities. For 46 States with a CSA but with no AP in force, the Agency concluded only that declared nuclear material remained in peaceful activities.[54]

North Korea

Because North Korea since 2002 has refused to accept IAEA safeguards, the agency has attempted to analyze the North's nuclear activities through satellite images and other information. The IAEA Director-General summarized the current situation of North Korea's nuclear issues in relation to the implementation of the IAEA safeguards in August 2018, as follows.[55]

- Yongbyon Experimental Nuclear Power Plant (5MW(e)): During the reporting period there have been indications consistent with the reactor's operation.

[52] IAEA, *IAEA Annual Report 2017*, September 2018, p. 15.
[53] GC(62)/RES/10, September 21, 2018.
[54] *IAEA Annual Report 2017*, September 2018, p. 90.
[55] GOV/2018/34-GOV(62)/12, August 20, 2018.

- Radiochemical Laboratory: Between late-April and early-May 2018, there were indications of the operation of the steam plant that serves the Radiochemical Laboratory. The duration of the steam plant's operation was not sufficient to have supported the reprocessing of a complete core from the 5MW(e) reactor.
- Yongbyon Nuclear Fuel Rod Fabrication Plant: There have been indications consistent with the use of the reported centrifuge enrichment facility located within the plant, including the operation of the cooling units as well as regular movements of vehicles.

In this report, the IAEA admitted that "its knowledge of the DPRK's nuclear programme is limited and, as further nuclear activities take place in the country, this knowledge is declining" because the IAEA could not carry out verification activities in North Korea. Still, the IAEA also stated: "an Executive Group was formed within the Secretariat and a DPRK Team was formed within the Department of Safeguards in August 2017. Since the Director General's previous report, the DPRK Team and the Executive Group have intensified their efforts. The DPRK Team has increased monitoring of the DPRK's nuclear programme through more frequent collection of satellite imagery and has enhanced its readiness to promptly undertake any activities it may be requested to conduct in the DPRK."[56]

Iran

The IAEA verifies and monitors implementation of Iran's nuclear obligations under the JCPOA, as well as the IAEA Safeguards Agreement. IAEA Director-General reports have been regularly submitted to the Board of Governors every quarter. At the 2018 IAEA General Conference, Director-General Amano stated: "Iran is implementing its nuclear-related commitments under the JCPOA…The Agency continues to verify the non-diversion of nuclear material declared by Iran under its Safeguards Agreement. Evaluations regarding the absence of undeclared nuclear material and activities in Iran continue."[57] In March, he also stated: "We have carried out more than 60 complementary accesses and visited more than 190 buildings since JCPOA Implementation Day."[58] In addition, the IAEA Annual Report noted that "[t]he Agency … has conducted complementary accesses under the Additional Protocol to all the sites and locations in Iran which it needed to visit."[59]

The Trump administration, as mentioned by the President in his statement in May 2018 regarding the U.S. withdrawal from the JCPOA,

[56] Ibid.

[57] "Director General's Statement to Sixty-second Regular Session of IAEA General Conference," September 17, 2018, https://www.iaea.org/newscenter/statements/director-generals-statement-to-sixty-second-regular-session-of-iaea-general-conference.

[58] Francois Murphy, "Collapse of Iran Nuclear Deal Would be 'Great Loss', IAEA Tells Trump," *Reuters*, March 5, 2018, https://www.reuters.com/article/us-iran-nuclear/collapse-of-iran-nuclear-deal-would-be-great-loss-iaea-tells-trump-idUSKBN1GH1I9.

[59] GOV/2018/33, August 30, 2018.

Table 2-1: The status of the conclusion and implementation of the IAEA safeguards agreement by the NNWS party to the NPT

(as of December 2017)

	CSA (Year)*	Additional Protocol (Year) *	Broader conclusion drawn	Integrated safeguards
Australia	1974	1997	○	○
Austria	1996	2004	○	○
Belgium	1997	2004	○	○
Brazil	1994			
Canada	1972	2000	○	○
Chile	1995	2003	○	○
Egypt	1982			
Germany	1977	2004	○	○
Indonesia	1980	1999	○	○
Iran	1974	Signed**		
Japan	1977	1999	○	○
Kazakhstan	1995	2007	○	○
South Korea	1975	2004	○	○
Mexico	1973	2011		
Netherlands	1977	2004	○	○
New Zealand	1972	1998	○	○
Nigeria	1988	2007		
Norway	1972	2000	○	○
Philippine	1974	2010	○	○
Poland	2007	2007	○	○
Saudi Arabia	2009			
South Africa	1991	2002	○	○
Sweden	1995	2004	○	○
Switzerland	1978	2005	○	
Syria	1992			
Turkey	2006	2001	○	
UAE	2003	2010		
North Korea***	1992			

* (Year) shows when the CSA or Additional Protocol has been enforced.
**Iran has accepted to provisionally apply the Additional Protcol.
*** North Korea has refused to accept comprehensive safeguards since it announced its withdrawal from the NPT in 1993.

Source: IAEA, “Safeguards Statement for 2017,” https://www.iaea.org/sites/default/files/18/06/statement-sir-2017.pdf.

has criticized that the agreement cannot prevent Iran's nuclear development since it does not give the IAEA the right to conduct unconditional inspections of Iran's military facilities.[60] The IAEA argued that it has conducted the highest standard of inspections, and that it is unrealistic to inspect military facilities in the absence of suspicion.[61] On the other hand, Iran's envoy to the IAEA said Iran would "not heed a call to cooperate more fully with U.N. nuclear inspectors until a standoff over the future of its agreement with major powers is resolved."[62] President Rouhani cautioned that Iran could reduce its co-operation with the IAEA if the U.S. attitudes against Iran and the JCPOA continued.[63]

Syria

As for Syria, the IAEA Director-General judged in May 2011 that the facility at Dair Alzour, which was destroyed by an Israeli air raid in September 2007, was very likely a clandestinely constructed, undeclared nuclear reactor. While the IAEA repeatedly called on Syria to cooperate fully with the Agency so as to solve the outstanding issues, Syria has not responded to that request.[64]

(3) IAEA Safeguards Applied to NWS and Non-Parties to the NPT

Under the NPT, a NWS is not required to conclude a CSA with the IAEA. However, to alleviate the concerns about the discriminatory nature of the NPT, the NWS have voluntarily agreed to apply safeguards to some of their nuclear facilities and fissile material that are not involved in military activities. All NWS have also concluded tailored Additional Protocols with the IAEA.

The *IAEA Annual Report 2017* (Annex), published in September 2018, lists facilities in NWS under Agency safeguards or containing safeguarded nuclear material.[65] For these five NWS, the IAEA "concluded that nuclear material in selected facilities to which safeguards had been applied remained in peaceful activities

[60] "Remarks by President Trump on the Joint Comprehensive Plan of Action." Besides, U.S. Ambassador to the UN, Nikki Haley, in August 2017 encouraged the IAEA to seek access to Iranian military bases to ensure that Iran did not conceal activities prohibited by the JCPOA, particularly nuclear weapons-related activities prohibited under Section T. "Nuclear Inspectors Should Have Access to Iran Military Bases: Haley," *Reuters*, August 26, 2017, https://www.reuters.com/article/us-iran-nuclear-usa-haley-idUSKCN1B524I.

[61] "IAEA: 'Conducting World Highest Level Inspections,'" *Mainichi Shimbun*, May 9, 2018, https://mainichi.jp/articles/20180510/k00/00m/030/016000c. (in Japanese)

[62] "Iran Says in No Mood to Go Extra Mile on Nuclear Inspections," *Reuters*, June 6, 2018, https://www.reuters.com/article/us-iran-nuclear-iaea/iran-says-in-no-mood-to-go-extra-mile-on-nuclear-inspections-idUSKCN1J21E0.

[63] Bozorgmehr Sharafedin, "Iran Threatens to Cut Cooperation with Nuclear Body after Trump Move," *Reuters*, July 4, 2018, https://uk.reuters.com/article/uk-iran-oil-sanctions/iran-threatens-to-cut-cooperation-with-nuclear-body-after-trump-move-idUKKBN1JU1DM.

[64] *IAEA Annual Report 2017*, September 2018, p. 92.

[65] *IAEA Annual Report 2017*, GC(62)/3/Annex, Table A36(a). See also the *Hiroshima Report 2017*.

or had been withdrawn from safeguards as provided for in the agreements."[66] The IAEA does not publish the number of inspections conducted in the NWS. The safeguarded facilities include:

- China: Two power reactors, a research reactor, and an enrichment plant
- France: A fuel fabrication plant, a reprocessing plant, and an enrichment plant
- Russia: A separate storage facility
- The United Kingdom: An enrichment plant and two separate storage facilities
- The United States: A separate storage facility

Each NWS has already concluded an IAEA Additional Protocol. Among them, the respective Protocols by France, the United Kingdom and the United States stipulate that the IAEA can conduct complementary access. Among them, the United States is the only country that has hosted a complementary access visit by the IAEA. Compared to the three NWS mentioned above, application of IAEA safeguards to nuclear facilities by China and Russia are more limited. No provision for complementary access visits is stipulated in their Additional Protocols.

France and the United Kingdom respectively have offered to make certain civil nuclear material subject to IAEA safeguards under trilateral agreements with EURATOM and the IAEA. However, because of the prospective withdrawal of the United Kingdom from EU in March 2019, or "Brexit", the United Kingdom will withdraw from the EURATOM. The United Kingdom stated at the IAEA General Conference: "the UK is establishing a domestic nuclear safeguards regime which will deliver to existing Euratom standards. This will ensure that the IAEA retains its right to inspect all civil nuclear facilities, and will continue to receive all current safeguards reporting, ensuring that international verification of our safeguards activity continues to be robust."[67] In June 2018, the United Kingdom and the IAEA signed a new safeguards agreement along with an Additional Protocol.

Between 1996 and 2002, Russia, the United States and the IAEA undertook to investigate technical, legal and financial issues associated with IAEA verification of fissile material derived from dismantled nuclear warheads. However, such material has not yet been under the IAEA verification.

India, Israel and Pakistan have concluded facility-specific safeguards agreements based on INFCIRC/66. These non-NPT states have accepted IAEA inspections of the facilities that they declare as subject to these agreements. In this regard, Pakistan and the IAEA brought into force a safeguards agreement based on INFCIRC/66, under which two nuclear reactors provided by Pakistan are subject to the IAEA safeguards. According to the *IAEA Annual Report 2017*, the facilities placed under IAEA

[66] *IAEA Annual Report 2017*, September 2018, p. 90.

[67] "Statement by the United Kingdom," IAEA General Conference, September 18-22, 2017, https://www.iaea.org/sites/default/files/gc61-uk-statement.pdf.

safeguards or containing safeguarded nuclear material in non-NPT states as of December 31, 2016 are as follows:[68]

- India: Eight power reactors, two fuel fabrication plants, two reprocessing plants, and a separate storage facility
- Israel: A research reactor
- Pakistan: Six power reactors and two research reactors

Regarding their activities in 2017, the IAEA "concluded that nuclear material, facilities or other items to which safeguards had been applied remained in peaceful activities."[69]

Concerning the protocols additional to non-NPT states' safeguards agreements (which differ significantly from the model Additional Protocol), the Indian-IAEA Additional Protocol entered into force on July 25, 2014. This Additional Protocol is similar to ones that the IAEA concluded with China and Russia, with provisions on providing information and protecting classified information but no provision on complementary access. No negotiation has yet begun for similar protocols with Israel or Pakistan.

Some NNWS call on the NWS for further application of the IAEA safeguards to their nuclear facilities in order to alleviate a discriminative nature that NNWS are obliged to accept full scope safeguards to their respective nuclear activities while NWS do not need to do so. The NAM countries, in particular, continue to demand that the NWS and non-NPT states should accept full-scope safeguards.[70]

(4) Cooperation with the IAEA

One of the most important measures to strengthen the effectiveness of the IAEA safeguards system is to promote the universal application of the Additional Protocol. Among the countries surveyed in this project, Australia, Austria, Belgium, Canada, Chile, France, Germany, Indonesia, Japan, South Korea, Mexico, the Netherlands, New Zealand, Nigeria, Norway, the Philippines, Poland, Sweden, Switzerland, Turkey, the UAE, the United Kingdom and the United States consider that the Additional Protocol is "an integral part" of the current IAEA safeguards system.[71]

On the other hand, the NAM countries argued that, "additional measures related to safeguards shall not affect the rights of the [NNWS], which are already committed to the non-proliferation of nuclear weapons and have renounced the

[68] *IAEA Annual Report 2017*, GC(62)/3/Annex, Table A36(a).

[69] *IAEA Annual Report 2017*, September 2018, p. 90.

[70] NPT/CONF.2020/PC.II/WP.23, March 26, 2018.

[71] See statements addressed by respective countries at the IAEA General Conferences and the NPT Review Conference.

nuclear-weapon option."[72] Brazil also said at the 2018 NPT PrepCom, "the Additional Protocol does not establish a safeguards standard under the NPT. For countries that belong to NWFZ, that are committed to the NPT's comprehensive safeguards and to additional layers of non-proliferation obligations and systems of verification and accountability, the AP is unnecessary."[73]

Still, there are certain NAM countries which have concluded Additional Protocols and consider that a safeguards agreement with an Additional Protocol represents the safeguards standard. While arguing that acceptance of the Additional Protocol is a voluntary measure, South Africa nonetheless regards it as "an indispensable instrument which enables the IAEA to build confidence and provide credible assurances regarding the absence of undeclared nuclear material and activities."[74] Russia stated: "We find it necessary to ensure gradual strengthening of the IAEA safeguards system through universalisation of the Additional Protocols that together with the Comprehensive Safeguards Agreement should become a globally recognized verification standard. At the same time, we stress that signing Additional Protocol with the Agency remains a purely voluntary for the NPT States Parties."[75]

In the resolution titled "Strengthening the Effectiveness and Improving the Efficiency of Agency Safeguards," adopted at the IAEA General Conference in 2018, the following points were stated, based on divergent views regarding additional protocols:[76]

- "Bearing in mind that it is the sovereign decision of any State to conclude an additional protocol, but once in force, the additional protocol is a legal obligation, encourages all States which have not yet done so to conclude and to bring into force additional protocols as soon as possible and to implement them provisionally pending their entry into force in conformity with their national legislation."
- "Notes that, in the case of a State with a comprehensive safeguards agreement supplemented by an additional protocol in force, these measures represent the enhanced verification standard for that State."

The IAEA has contemplated a state-level concept (SLC), in which the Agency considers a broad range of information about a country's nuclear capabilities and tailors its safeguards activities in each country accordingly, so as to make IAEA safeguards more effective and

[72] NPT/CONF.2020/PC.II/WP.21, March 23, 2018. During the negotiations on the Treaty on Prohibition of Nuclear Weapons (TPNW) in 2017, the NAM countries opposed a proposal to stipulate an obligation of concluding an Additional Protocol in the treaty. As a result, the TPNW obliges states parties without possessing nuclear weapons to conclude just a Comprehensive Safeguards Agreements.

[73] "Statement by Brazil," Cluster 2, 2018 NPT PrepCom, April 27, 2018.

[74] "Statement by South Africa," Cluster 2, 2018 NPT PrepCom, April 27, 2018.

[75] "Statement by Russia," Cluster 2, 2018 NPT PrepCom, April 27, 2018.

[76] GC(62)/RES/10, September 21, 2018.

efficient. In the resolution titled "Strengthening the Effectiveness and Improving the Efficiency of Agency Safeguards," adopted at the IAEA General Conference in 2018, important assurances about the SLC mentioned below were welcomed:[77]

- The SLC does not, and will not, entail the introduction of any additional rights or obligations on the part of either States or the Agency, nor does it involve any modification in the interpretation of existing rights and obligations;
- The SLC is applicable to all States, but strictly within the scope of each individual State's safeguards agreement(s);
- The SLC is not a substitute for the Additional Protocol and is not designed as a means for the Agency to obtain from a State without an Additional Protocol the information and access provided for in the Additional Protocol;
- The development and implementation of State-level approaches requires close consultation with the State and/or regional authority, particularly in the implementation of in-field safeguards measures; and
- Safeguards-relevant information is only used for the purpose of safeguards implementation pursuant to the safeguards agreement in force with a particular State—and not beyond it.

According to the IAEA, as of June 2018, State level safeguards approaches (SLAs) "had been developed and approved for implementation for 67 States with a CSA and an AP in force, and a broader conclusion; 34 States with a CSA and an AP in force but without a broader conclusion; 29 States with a CSA but no AP in force (of which 28 have SQPs); and one State with a VOA and an AP in force."[78]

Regarding research and development of safeguards technologies, under its long-term plan,[79] the IAEA conducted the "Development and Implementation Support Programme for Nuclear Verification 2018-2019,"[80] in which 20 countries (including Australia, Belgium, Brazil, Canada, China, France, Germany, South Korea, the Netherlands, Russia, South Africa, Sweden, the United Kingdom and the United States) and the European Commission (EC) participated.

(5) Implementing Appropriate Export Controls on Nuclear-Related Items and Technologies

A) Establishment and implementation of the national control systems

On establishing and implementing national control systems regarding export controls on nuclear-related items and technologies, there were few remarkable developments in 2017. As

[77] Ibid.

[78] IAEA, "Strengthening the Effectiveness and Improving the Efficiency of Agency Safeguards," GC(62)/8, July 31, 2018.

[79] IAEA, "IAEA Department of Safeguards Long-Term R&D Plan, 2012-2023," January 2013.

[80] IAEA, "Development and Implementation Support Programme for Nuclear Verification 2018-2019," January 2018.

described in the previous *Hiroshima Report*, the following countries surveyed in this Report belong to the four international export control regimes,[81] including the Nuclear Suppliers Group (NSG), have national implementation systems in place, and have implemented effective export controls regarding nuclear- (and other WMD-) related items and technologies through list and catch-all controls: Australia, Austria, Belgium, Canada, France, Germany, Japan, South Korea, the Netherlands, New Zealand, Norway, Poland, Sweden, Switzerland, the United Kingdom and the United States.

These countries have also proactively made efforts to strengthen export controls. For example, Japan held the 25th Asian Export Control Seminar in February-March 2018. The purpose of this annual seminar is to "assist export control officers in Asian countries and regions." Persons in charge of export control from 33 Asian and other regional major countries participated in the seminar.

Among other countries surveyed in this project, Brazil, China, Kazakhstan, Mexico, Russia, South Africa and Turkey are members of the NSG. These countries have set up export control systems, including catch-all controls.
As for non-NSG members, the UAE and the Philippines have been developing their respective national export control systems, whereas Egypt, Indonesia and Saudi Arabia have yet to establish sufficient export control legislations and systems.

India, Israel and Pakistan have also set up national export control systems, including catch-all controls.[82] India's quest for membership in the NSG is supported by some member states, but consensus on the matter was not reached in 2018. Pakistan has also sought to join the NSG. Meanwhile, in March 2018, the United States imposed sanctions on seven Pakistani companies over claims that they were involved in procurement activities with those already on the U.S. "Entity List."[83]

At the time of writing, the status of export control implementation by North Korea, Iran and Syria is not clear. Rather, cooperation among these countries in ballistic missile development remains a concern, as mentioned below. In addition, North Korea was involved in the past in constructing a graphite-moderated reactor in Syria to produce plutonium.

A U.S. think tank assessed that among the 122 countries voting in favor of adopting the TPNW, only 29 (or 24 percent) have adequate export

[81] Aside from the NSG, Australia Group (AG), Missile Technology Control Regime (MTCR), and Wassenaar Arrangement (WA).

[82] Regarding a situation of Pakistani export controls, see Paul K. Kerr and Mary Beth Nikitin, "Pakistan's Nuclear Weapons," *CRS Report*, August 1, 2016, pp. 25-26.

[83] Drazen Jorgic, "U.S. Sanctions Pakistani Companies Over Nuclear Trade," *Reuters*, March 26, 2018, https://www.reuters.com/article/us-pakistan-usa-sanctions/u-s-sanctions-pakistani-companies-over-nuclear-trade-idUSKBN1H20IO.

control legislation.[84]

B) Requiring the conclusion of the Additional Protocol for nuclear export

Article III-2 of the NPT stipulates, "Each State Party to the Treaty undertakes not to provide: (a) source or special fissionable material, or (b) equipment or material especially designed or prepared for the processing, use or production of special fissionable material, to any non-nuclear-weapon State for peaceful purposes, unless the source or special fissionable material shall be subject to the safeguards required by this Article." In the Final Document of the 2010 NPT RevCon, "[t]he Conference encourage[d] States parties to make use of multilaterally negotiated and agreed guidelines and understandings in developing their own national export controls" (Action 36). Under the NSG Guidelines Part I, one of the conditions for supplying materials and technology designed specifically for nuclear use is to accept the IAEA comprehensive safeguards. In addition, NSG member states agreed on the following principle in June 2013:[85]

> Suppliers will make special efforts in support of effective implementation of IAEA safeguards for enrichment or reprocessing facilities, equipment or technology and should, consistent with paragraphs 4 and 14 of the Guidelines, ensure their peaceful nature. In this regard suppliers should authorize transfers, pursuant to this paragraph, only when the recipient has brought into force a Comprehensive Safeguards Agreement, and an Additional Protocol based on the Model Additional Protocol or, pending this, is implementing appropriate safeguards agreements in cooperation with the IAEA, including a regional accounting and control arrangement for nuclear materials, as approved by the IAEA Board of Governors.

The NPDI and the Vienna Group of Ten have argued that conclusion and implementation of the CSA and the Additional Protocol should be a condition for new supply arrangements with NNWS.[86] Some of the bilateral nuclear cooperation agreements that Japan and the United States concluded recently with other capitals make the conclusion of the Additional Protocol a prerequisite for their cooperation with respective partner states. On the other hand, the NAM countries continue to argue that supplier countries should refrain from imposing or maintaining any restriction or limitation on the transfer of nuclear equipment, material and technology to other states parties with comprehensive safeguards agreements.[87]

Issues on enrichment and reprocessing under the bilateral nuclear cooperation agreements

Enriching uranium and reprocessing spent

[84] David Albright, Sarah Burkhard, Allison Lach and Andrea Stricker, "Most Nuclear Ban Treaty Proponents are Lagging in Implementing Sound Export Control Legislation," Institute for Science and International Security, September 27, 2017, http://isis-online.org/isis-reports/detail/most-nuclear-ban-treaty-proponents-are-lagging-in-implementing-sound-export.

[85] INFCIRC/254/Rev.12/Part 1, November 13, 2013.

[86] See, for instance, NPT/CONF.2020/PC.II/WP.5, March 7, 2018.

[87] NPT/CONF.2020/PC.II/WP.20, March 23, 2018.

fuel by NNWS is not prohibited under the NPT if the purpose is strictly peaceful and the activities are under IAEA safeguards, yet they are highly sensitive activities in light of nuclear proliferation. The spread of enrichment and reprocessing (E&R) technologies would mean that more countries would acquire the potential for manufacturing nuclear weapons. As mentioned above, NSG guidelines make implementation of the Additional Protocol by the recipient state a condition for transfer of enrichment or reprocessing facilities, equipment or technology.

While the U.S.-UAE and U.S.-Taiwan Nuclear Cooperation Agreements stipulate a so-called "gold standard"—the recipients are obliged to forgo enrichment and reprocessing activities—other bilateral agreements concluded and updated by the United States, such as that with Vietnam in 2014, do not stipulate similar obligations.[88]

The Japan-U.S. Nuclear Cooperation Agreement, which stipulates comprehensive prior consent to Japan's E&R activities, was automatically extended since neither side notified an intention to terminate or re-negotiate the agreement by January 2018, six months prior to its expiration.

Whether that a nuclear cooperation agreement being negotiated between Saudi Arabia and the United States will include the gold standard has been the subject of considerable public attention. Saudi Arabia plans to build 16 nuclear reactors for power generation over the next 25 years. Riyadh explains that the purpose is strictly civilian, that is, to increase both domestic energy supply and to diversity beyond oil exports. However, Saudi Arabia, which has confronted Iran, has repeatedly made clear is intention to acquire nuclear weapons should Iran develop them. For instance, Crown Prince Mohammed bin Salman commented that, "Saudi Arabia does not want to acquire any nuclear bomb, but without a doubt if Iran developed a nuclear bomb, we will follow suit as soon as possible."[89] There is thus concern that Saudi Arabian nuclear development would increase the possibility of nuclear proliferation. Under former President Obama, the United States asked Saudi Arabia to forego enrichment and reprocessing activities, but Saudi Arabia did not accept this. Although the policy of the Trump administration is not necessarily clear, several U.S. lawmakers from both parties introduced legislation that would require the House of Representatives and the Senate to affirmatively approve any so-called 123 agreement with the kingdom. Typically, such agreements go into

[88] The U.S.-Mexican Nuclear Cooperation Agreement concluded in May 2018, it is stated in the preamble that Mexico will not conduct sensitive nuclear activities, which is called a "silver standard."

[89] "Saudi Crown Prince Says Will Develop Nuclear Bomb If Iran oes: CBS TV," *Reuters*, March 15, 2018, https://www.reuters.com/article/us-saudi-iran-nuclear/saudi-crown-prince-says-will-develop-nuclear-bomb-if-iran-does-cbs-tv-idUSKCN1GR1MN. See also Nicole Gaouette, "Saudi Arabia Set to Pursue Nuclear Weapons If Iran Restarts Program," *CNN*, May 9, 2018, https://edition.cnn.com/2018/05/09/politics/saudi-arabia-nuclear-weapons/index.html.

effect unless majorities of Congress pass joint resolutions of disapproval.[90]

C) Implementation of the UNSCRs concerning North Korean and Iranian nuclear issues

With regard to the North Korean nuclear issue, UN Member States are obliged to implement measures set out in the resolutions adopted by the UN Security Council, including embargos on nuclear-, other WMD-, and ballistic missile-related items, material, and technologies. The Panel of Experts, established pursuant to UNSCR 1874 (2009), has published annual reports on its findings and recommendations about the implementation of the resolutions. As for the Iranian nuclear issue, the Iran Sanctions Committee and Panel of Experts ceased to exist after the conclusion of the JCPOA, at the insistence of Iran, and the UN Security Council now has responsibility of oversight of remaining limitations.[91]

North Korea

The UN Security Council has adopted numerous resolutions criticizing North Korean nuclear and missile activities. In 2018, as mentioned above, expectations for North Korean denuclearization increased, and inter-Korean and U.S.-North Korean relationships improved. However, no concrete steps concerning North Korea's abandonment of its nuclear weapons and missiles were agreed. Meanwhile, although sanctions against North Korea were not officially eased, Russia and China relaxed implementation of these measures.

The annual Report of the Panel Experts published in March 2018 pointed out North Korea's activities in defiance of the UNSCRs, such as:[92]

- North Korea flouted the most recent resolutions adopted in 2017 by exploiting global oil supply chains, complicit foreign nationals, offshore company registries and the international banking system.
- The Panel investigated illicit ship-to-ship transfers of petroleum.
- North Korea continued to export almost all the commodities prohibited in the resolutions, generating nearly $200 million in revenue between January and September 2017.
- In continuing its illicit coal exports to China, South Korea, Malaysia, Russia and Vietnam, the North combined deceptive navigation patterns, signals manipulation, trans-shipment and fraudulent documentation to obscure the origin of the coal.
- North Korea was involved in prohibited

[90] Timothy Gardner, "U.S. Lawmakers Seek Oversight Over Any Saudi Nuclear Power Deal," *Reuters*, December 20, 2018, https://www.reuters.com/article/us-usa-saudi-nuclear-congress/u-s-lawmakers-seek-oversight-over-any-saudi-nuclear-power-deal-idUSKCN1OI2IM.

[91] David Albright and Andrea Stricker, "JCPOA Procurement Channel: Architecture and Issues," Institute for Science and International Security, December 11, 2015, http://isis-online.org/uploads/isis-reports/documents/Parts_1_and_2_JCPOA_Procurement_Channel_Architecture_and_Issues_Dec_2015-Final.pdf.

[92] S/2018/171, March 5, 2018.

military cooperation projects stretching from Africa to Asia-Pacific region, including ongoing ballistic missile cooperation with Syria and Myanmar.

- North Korean diplomats continue to play a key role in its prohibited programs and activities under the resolutions.
- North Korea is accessing the global financial system through deceptive practices combined with critical deficiencies in the implementation of financial sanctions. Financial institutions of the Democratic People's Republic of Korea, including designated banks, maintain more than 30 overseas representatives who live and move freely across borders in the Middle East and Asia, where they control bank accounts, facilitate transactions and deal in bulk cash.

A midterm report by the Panel of Experts in September 2018 pointed out North Korea's smuggling of refined petroleum beyond the annual upper limit through illicit ship-to-ship transfers, some of which involved Russian vessels. The Panel could not submit the final report to the Security Council due to Russian pressure to revise these finding.[93] By the end of 2018, the midterm report had not been published.

At a UN Security Council Briefing on Nonproliferation and the Implementation and Enforcement of UN Sanctions on North Korea in September, the U.S. ambassador to the UN, Nikki Haley, stated that during January-August 2018 "the United States tracked at least 148 instances of oil tankers delivering refined petroleum products obtained through illegal ship-to-ship transfers. We estimate that at the least, North Korea has obtained over 800,000 barrels of refined petroleum products in the first eight months of this year. That's 160 percent of the 2018 annual cap of 500,000. In reality, we think they have obtained four times the annual quota in the first 8 months of this year."[94] She also criticized Russia, saying: "Russia is actively working to undermine the enforcement of the Security Council's sanctions on North Korea. Its violations are not one-offs. They are systematic. Russia has not simply looked the other way as its nationals and entities engage in activities explicitly prohibited by UN sanctions. Russia has engaged in a concerted campaign in the Security Council to cover up violations of sanctions, whether they're committed by Russia or citizens of other states."[95] Russia denied the U.S. allegations.

Although the whole picture of such illegal activities by North Korea has not been elucidated, it is alleged to have engaged in various activities, including earning foreign currency

[93] Hamish Macdonald, "Report Originally Blocked by Russia in August, Subsequently Released to the UNSC," *NK News*, September 14, 2018, https://www.nknews.org/2018/09/russia-pressured-un-panel-to-alter-north-korea-sanctions-report-haley/.

[94] Nikki Haley, U.S. Permanent Representative to the United Nations, U.S. Mission to the United Nations, "Remarks at a UN Security Council Briefing on Nonproliferation and the Implementation and Enforcement of UN Sanctions on North Korea," September 17, 2018, https://usun.state.gov/remarks/8613.

[95] Ibid.

to support nuclear weapons development by utilizing foreign networks. Some news articles highlighted the following alleged cases:

- The head of Germany's BfV domestic intelligence agency said that North Korea has been using its embassy in Berlin to procure parts for its nuclear and missile program.[96]
- North Korea has used cryptocurrencies to avoid the U.S. sanctions.[97]
- According to South Korea's customs agency, three South Korean firms imported coal from North Korea disguised as Russian products in violation of U.N. resolutions. 35,000 tons of coal was brought into South Korea between April and October in 2017, worth 6.6 billion won ($5.8 million).[98]
- Russia has been letting more than 10,000 new North Korean laborers enter the country and issuing fresh work permits since such activities were prohibited under the Security Council resolutions. In addition, some companies hiring North Koreans are joint ventures with North Korean entities, an apparent violation of sanctions banning "all joint ventures or cooperative entities" with North Korean companies and citizens.[99]

Regarding sanctions against North Korea, China's behavior has been drawing attention because of its close relationship with North Korea. Although China has also been criticized for its inadequate enforcement efforts, it implemented some measures to strengthen sanctions against North Korea in 2018, *inter alia*:

- Chinese Commerce Ministry announced in January that it would restrict exports of crude oil, refined petroleum products and metals (including steel) to North Korea;[100] and
- In April, as a measure in accordance with the Security Council resolution adopted in September 2017, China announced a list of 32 dual-use items that could be used for WMD development and are prohibited for export to North Korea.[101]

[96] "German Spy Chief Alleges North Korea Uses Berlin Embassy for Procurement," *Reuters*, February 3, 2018, https://www.reuters.com/article/us-germany-northkorea/german-spy-chief-alleges-north-korea-uses-berlin-embassy-for-procurement-idUSKBN1FN0J2.

[97] Alex Ward, "How North Korea Uses Bitcoin to Get Around US Sanctions," *Vox*, February 28, 2018, https://www.vox.com/world/2018/2/28/17055762/north-korea-sanctions-bitcoin-nuclear-weapons.

[98] Hyonhee Shin, "Three South Korean Firms Imported North Korean Coal in Breach of Sanctions - Customs Service," *Reuters*, August 10, 2018, https://uk.reuters.com/article/uk-northkorea-southkorea-coal/three-south-korean-firms-imported-north-korean-coal-in-breach-of-sanctions-customs-service-idUKKBN1KV0EL.

[99] Ian Talley and Anatoly Kurmanaev, "Thousands of North Korean Workers Enter Russia Despite U.N. Ban," *Wall Street Journal*, August 2, 2018, https://www.wsj.com/articles/russia-is-issuing-north-korean-work-permits-despite-u-n-ban-1533216752.

[100] He Huifeng, China Tightens Crude Oil Supplies to North Korea in New Sanctions," *South China Morning Post*, January 6, 2018, https://www.scmp.com/news/china/diplomacy-defence/article/2127058/china-tightens-crude-oil-supplies-new-sanctions-north.

[101] "China Bans Exports of 'Dual Use' Items to North Korea," *Reuters*, April 9, 2018, https://uk.reuters.com/article/uk-northkorea-missiles-china/china-bans-exports-of-dual-use-items-to-north-korea-idUKKBN1HF11I.

In the meantime, China and Russia have sought to alleviate sanctions against North Korea, following the improvement of circumstances regarding the nuclear concern. On June 28, 2018, after the U.S.-North Korean summit meeting, China submitted to the Security Council a draft press statement that would have expressed an intention to relax sanctions against the North. However, the press statement was not issued due to strong opposition by some members, including the United States.[102] At a ministerial meeting of the Security Council on September 27, China and Russia argued that the sanctions should have been alleviated, partly because of improvement of the inter-Korean and U.S.-North Korean relations, and partly because of necessity to send a positive signal to the North for extracting concessions. Furthermore, the deputy foreign ministers of Russia, China and North Korea said in a joint communique released after their consultations in October, "Taking into account the important steps towards denuclearization made by the Democratic People's Republic of Korea, the sides believe the UN Security Council should start in due time revising the sanctions against the DPRK."[103] In addition to those countries, South Korea has indicated that providing humanitarian assistances and relaxing sanctions would be needed for promoting North Korean denuclearization. However, many Western countries, including the United States, oppose the easing of sanctions at this moment, as prerequisites for providing such rewards are that the North takes concrete and substantial actions toward denuclearization.

In addition to sanctions under the UNSCRs, some countries impose respective unilateral sanctions against North Korea. For example, Japan, South Korea and the United States have expanded their respective lists of entities and individuals subject to a travel ban and/or asset freeze over their involvement in the North's nuclear and missile developments. The lists include not just North Korean but also Chinese and Russian entities and individuals. In 2018, the United States imposed sanctions on North Korean and Russian banks for knowingly facilitating a significant transaction on behalf of an individual designated for WMD-related activities in connection with North Korea. The United States also sanctioned companies based in China, Russia and Singapore, as well as the head of the Russian firm, accusing them of helping the North evade sanctions.[104]

Regarding illicit maritime activities, including ship-to-ship transfers with North Korean-flagged vessels prohibited by UNSCRs, the Japan Maritime Self-Defense Force has engaged in monitoring and surveillance activities in the

[102] "China submitted a draft statement to the Security Council," *Asahi Shimbun*, June 30, 2018, https://www.asahi.com/articles/ASL6Y5DZ1L6YUHBI021.html. (in Japanese)

[103] "Russia, China, North Korea Call for Review of Sanctions against Pyongyang," *Tass*, October 10, 2018, http://tass.com/world/1025315.

[104] Matthew Lee, "Nuke Talks Uncertain, US Hits Shippers with NKorea Sanctions," *Associated Press*, August 16, 2018, https://apnews.com/3d8c9433ecd94399bad982660ccf9622/US-sanctions-shipping-firms-over-North-Korea-trade; U.S. Department of Treasury, "Treasury Targets Russian Bank and Other Facilitators of North Korean United Nations Security Council Violations," Press Release, August 3, 2018, https://home.treasury.gov/news/press-releases/sm454.

Sea of Japan and the Yellow Sea since December 2017. Japan's Foreign Ministry posted the North's illicit activities on the website.[105] Japan also issued a press release in September 2018 on the monitoring and surveillance activities conducted by Japan and the United States, together with Australia, Canada and New Zealand.[106]

Iran

In accordance with the JCPOA, approval of the Procurement Working Group, establishment under the agreement, is required for Iranian procurement of nuclear-related items and material. From December 15, 2017 to June 15, 2018, the Procurement Working Group received 13 procurement proposals. Among these proposals, eight were approved, two were withdrawn and three were under review.[107] From June 15 through December 11, 2018, five new proposals were submitted, and four of them were approved and one was under review. The report also noted that "some of the proposals that had been submitted during the previous reporting period were processed during this reporting period, of which two were withdrawn by the submitting Member State and one was disapproved."[108]

Nuclear-related cooperation between concerned states

In addition to the (reported) illicit activities mentioned above, it is often alleged that North Korea and Iran have been engaged in nuclear and missile development cooperation. Bilateral cooperation has been well documented in the area of missiles. In 2016, the United States imposed sanctions regarding such cooperation.[109] However, no concrete evidence has been revealed to support allegations of nuclear-related cooperation.[110]

Meanwhile, a London-based think tank assessed that the engines of North Korea's Hwasong-12 IRBM and Hwasong-14 ICBM are likely RD250s that were developed by the Soviet Union for the SS-18 ICBM, and may have been transferred to North Korea by entities in Russia or Ukraine.

[105] See Ministry of Foreign Affairs of Japan, "Suspicion of illegal ship-to-ship transfers of goods by North Korea-related vessels," November 30, 2018, https://www.mofa.go.jp/fp/nsp/page4e_000757.html.

[106] "Monitoring and Surveillance Activities by Partner Countries Against Illicit Maritime Activities Including Ship-to-Ship Transfers," Ministry of Foreign Affairs of Japan, September 7, 2018, https://www.mofa.go.jp/press/release/press1e_000088.html. See also Department of State, "International Efforts to Implement UN Security Council Resolutions on DPRK's Illicit Shipping Activities," Prese Statement, September 22, 2018, https://www.state.gov/r/pa/prs/ps/2018/09/286140.htm.

[107] S/20187/624, June 21, 2018.

[108] S/20187/1106, December 11, 2018.

[109] U.S. Department of Treasury, "Treasury Sanctions Those Involved in Ballistic Missile Procurement for Iran," January 17, 2016, https://www.treasury.gov/press-center/press-releases/Pages/jl0322.aspx.

[110] John Park and Jim Walsh, *Stopping North Korea, Inc.: Sanctions Effectiveness and Unintended Consequences* (Cambridge, MA: MIT Security Program, 2016), p. 33; Paul K. Kerr, Steven A. Hildreth and Mary Beth D. Nilitin, "Iran-North Korea-Syria Ballistic Missile and Nuclear Cooperation," *CRS Report*, February 26, 2016, pp. 7-9.

Both countries denied the allegation.[111]

In addition, the annual Report of the Panel Experts published in March 2018 indicated that North Korea and Syria continue to cooperate on WMD and ballistic missile-relate activities. According to the report, examples of North Korea's activities in defiance of the UNSCRs included: a group of ballistic missile technicians affiliated with the designated North Korean Academy of National Defence Science visited Syria in November 2016; and that there were more than 40 previously unreported shipments from North Korea to Syria between 2012 and 2017 by entities considered as front companies for the Syrian Scientific Studies Research Centre, which is alleged to be involved in chemical weapons development.[112]

D) Participation in the PSI

As of 2018, a total of 106 countries—including 21 member states of the Operational Expert Group (Australia, Canada, France, Germany, Japan, South Korea, the Netherlands, New Zealand, Norway, Poland, Russia, Turkey, the United Kingdom, the United States and others) as well as Belgium, Chile, Israel, Kazakhstan, the Philippines, Saudi Arabia, Switzerland, Sweden, the UAE and others—have expressed their support for the principles and objectives of the Proliferation Security Initiative (PSI). Many of them have participated and cooperated in PSI-related activities.[113]

The interdiction activities actually carried out within the framework of the PSI are often based on information provided by intelligence agencies; therefore, most of them are classified. However, several cases were reported of interdictions involving shipments of WMD-related material to North Korea and Iran. Additionally, participating states have endorsed the PSI statement of interdiction principles and endeavored to reinforce their capabilities for interdicting WMD through exercises and outreach activities. In July 2018, Japan hosted an interdiction exercise, named "Pacific Shield 18," in which six countries (Australia, Japan, South Korea, New Zealand, Singapore and the United States) participated, together with 19 observer countries.[114]

[111] Michael Elleman, "The Secret to North Korea's ICBM Success," *IISS Voices*, August 14, 2017, https://www.iiss.org/en/iiss%20voices/blogsections/iiss-voices-2017-adeb/august-2b48/north-korea-icbm-success-3abb. Ukraine's report of investigation is "Report of Secretary of the National Security and Defense Council of Ukraine, Head of the Working Group Oleksandr Turchynov on Investigation of the Information Stated in the Article of The New York Times," National Security and Defense Council of Ukraine, August 22, 2017, http://www.rnbo.gov.ua/en/news/2859.html.

[112] S/2018/171, March 5, 2018.

[113] Bureau of International Security and Nonproliferation, U.S. Department of State, "Proliferation Security Initiative Participants," June 9, 2015, http://www.state.gov/t/isn/c27732.htm. In December 2018, Palau endorsed the PSI.

[114] "Proliferation Security Initiative (PSI) Maritime Interdiction Exercise "Pacific Shield 18" Hosted by Japan," Ministry of Foreign Affairs of Japan, August 13, 2018, https://www.mofa.go.jp/dns/n_s_ne/page25e_000216.html. As observers, eight countries from OEG (Canada, France, Greece, Italy, Netherlands, Norway, Poland and Russia), six PSI participants in Asia-Pacific region (Brunei, Cambodia, Philippines, Thailand, Malaysia and Vietnam), and five non-PSI participants (India, Laos, Maldives, Myanmar and Pakistan) joined the exercise.

In January 2018, several PSI participating countries released a joint statement reiterating their commitment to impede and stop North Korea's illicit activities, including smuggling, and to take measures such as: inspecting proliferation-related shipments on vessels with the consent of the flag State, on the high seas, if they have information that provides reasonable grounds to believe that the cargo of such vessels contains items prohibited under UNSCRs; and prohibiting their nationals, persons subject to their jurisdiction, entities incorporated in their territory or subject to their jurisdiction, and vessels flying their flag, from facilitating or engaging in ship-to-ship transfers to or from DPRK-flagged vessels of any goods or items that are being supplied, sold, or transferred to or from the DPRK.[115]

E) Civil nuclear cooperation with non-parties to the NPT

In September 2008, the NSG agreed to grant India a waiver, allowing nuclear trade with the state. Since then, some countries have sought to engage in civil nuclear cooperation with India, and several countries, including Australia, Canada, France, Japan, Kazakhstan, South Korea, Russia and the United States, have concluded bilateral civil nuclear cooperation agreements with India.

Actual nuclear cooperation with India has not necessarily been concluded,[116] except India's import of uranium from France, Kazakhstan and Russia, and its conclusion of agreements to import uranium from Argentina, Australia, Canada, Mongolia and Namibia.[117]

Again in 2018, the NSG could not achieve consensus on India's membership application. China, the main opponent, has argued that applicant countries must be parties to the NPT. It is also reported that China will not accept India's participation in the NSG unless Pakistan is also accepted as a member.[118] Pakistan has argued that, as a state behaving responsibly regarding nuclear safety and security, it is qualified to be accepted as an NSG member. The NSG has considered a draft set of nine criteria to guide membership applications from states that are not party to the NPT. Items of condition written in a draft document in December 2016 included safeguards, moratorium on nuclear testing, and

[115] "Joint Statement from Proliferation Security Initiative (PSI) Partners in Support of United Nations Security Council Resolutions 2375 and 2397 Enforcement," January 12, 2018, https://www.psi-online.info/psi-info-en/aktuelles/-/2075616. Originally, 17 countries signed the joint statement. By the end of 2018, 47 countries became signatories, including Australia, Austria, Belgium, Canada, France, Germany, Japan, South Korea, Netherlands, Norway, Sweden, Switzerland, the United Kingdom, and the United States.

[116] See, for example, the *Hiroshima Report 2017*.

[117] Adrian Levy, "India Is Building a Top-Secret Nuclear City to Produce Thermonuclear Weapons, Experts Say," *Foreign Policy*, December 16, 2015, http://foreignpolicy.com/2015/12/16/india_nuclear_city_top_secret_china_pakistan_barc/.

[118] "China and Pakistan Join Hands to Block India's Entry into Nuclear Suppliers Group," *Times of India*, May 12, 2016, http://timesofindia.indiatimes.com/india/China-and-Pakistan-join-hands-to-block-Indias-entry-into-Nuclear-Suppliers-Group/articleshow/52243719.cms.

support of multilateral non-proliferation and disarmament regime.[119]

Meanwhile, China has been criticized for its April 2010 agreement to export two nuclear power reactors to Pakistan, which may constitute a violation of the NSG guidelines. China has claimed an exemption for this transaction under the "grandfather clause" of the NSG guidelines (i.e. it was not applicable as China became an NSG participant after the start of negotiations on the supply of the reactors). China will also supply enriched uranium to Pakistan for running those reactors.[120] Their construction started in November 2013 in Karachi. Because all other Chinese reactors that were claimed to be excluded from NSG guidelines under the grandfather clause were built at Chashma, there is a question about whether the exemption can also apply to the Karachi plant.[121]

The NAM countries have been critical of civil nuclear cooperation with non-NPT states, including India and Pakistan, and continue to argue that exporting states should refrain from transferring nuclear material and technologies to those states which do not accept IAEA comprehensive safeguards.[122]

(6) Transparency in the Peaceful Use of Nuclear Energy

A) Efforts for transparency

In addition to accepting IAEA full-scope safeguards, as described earlier, a state should aim to be fully transparent about its nuclear-related activities and future plans, in order to demonstrate that it has no intention of developing nuclear weapons. A state that concludes an Additional Protocol with the IAEA is obliged to provide information on its general plans for the next ten-year period relevant to any nuclear fuel cycle development (including nuclear fuel cycle-related research and development activities). Most countries actively promoting the peaceful use of nuclear energy have issued mid- or long-term nuclear development plans, including the construction of nuclear power plants.[123] The international community may be concerned about the possible development of nuclear weapon programs when states conduct nuclear activities without publishing their nuclear development plans (e.g., Israel, North Korea and Syria), or are engaged in nuclear activities which seem inconsistent with their plans (e.g., allegedly, Iran).

[119] See Kelsey Davenport, "Export Group Mulls Membership Terms," *Arms Control Today*, Vol. 47, No. 1 (January/February 2017), p. 50.

[120] "Pakistan Starts Work on New Atomic Site, with Chinese Help," *Global Security Newswire*, November 27, 2013, http://www.nti.org/gsn/article/pakistan-begins-work-new-atomic-site-being-built-chinese-help/.

[121] Bill Gertz, "China, Pakistan Reach Nuke Agreement," *Washington Free Beacon*, March 22, 2013, http://freebeacon.com/ china-pakistan-reach-nuke-agreement/.

[122] NPT/CONF.2020/PC.II/WP.20, March 23, 2018. See also NPT/CONF.2020/PC.II/WP.1, March 6, 2018.

[123] The World Nuclear Association's website (http://world-nuclear.org/) provides summaries of the current and future plans of civil nuclear programs around the world.

From the standpoint of transparency, communications received by the IAEA from certain member states concerning their policies regarding the management of plutonium, including the amount of plutonium held, are also important. Using the format of the Guidelines for the Management of Plutonium (INFCIRC/549) agreed in 1997, the five NWS, Belgium, Germany, Japan and Switzerland annually publish data on the amount of civil unirradiated plutonium under their control. By December 2018, NWS except Russia had not declared their civilian plutonium holdings as of December 2017. Germany had reported its holdings of not only civil plutonium but also HEU.[124] Japan's report submitted to the IAEA was based on the annual report "The Current Situation of Plutonium Management in Japan" released by the Japan Atomic Energy Commission.[125]

In July 2018, Japan's Atomic Energy Commission (JAEC) issued a new policy paper, "The Basic Principles on Japan's Utilization of Plutonium," which for the first time stated that: "Japan will reduce the size of its plutonium stockpile." It also reaffirms that "the stockpile is not to increase from the current level" through, inter alia, following measures: "Instruct the operators so as to secure a balance between demand and supply of plutonium, minimize the feedstock throughout the process between reprocessing and irradiation, and reduce the feedstock to a level necessary for proper operation of the RRP and other facilities"; and "Work on reducing Japan's plutonium stockpile stored overseas through measures including promoting collaboration and cooperation among the operators."[126]

Australia, Austria, Brazil, Canada, Chile, Egypt, Iran, Kazakhstan, South Korea, Mexico, the Netherlands, New Zealand, Nigeria, Norway, the Philippines, Poland, Saudi Arabia, South Africa, Sweden, Turkey and the UAE have published the amount of fissile material holdings, or at least have placed their declared nuclear material under IAEA safeguards. From this, it may be concluded that these states have given clear evidence of transparency about their civil nuclear activities.

B) Multilateral approaches to the fuel cycle

Several countries have sought to establish multilateral approaches to the fuel cycle, including nuclear fuel banks, as one way to dissuade NNWS from adopting indigenous enrichment technologies. Austria, Germany, Japan, Russia, the United Kingdom, the United States and the EU, as well as six countries

[124] "2017 Civilian Plutonium Declarations Submitted to IAEA," *IPFM Blog*, September 19, 2018, http://fissilematerials.org/blog/2018/09/civilian_plutonium_infcir.html.

[125] Office of Atomic Energy Policy, Cabinet Office, "The Status Report of Plutonium Management in Japan—2017," July 31, 2018, http://www.aec.go.jp/jicst/NC/about/kettei/180731_e.pdf.

[126] Japan Atomic Energy Commission, "The Basic Principles on Japan's Utilization of Plutonium," July 31, 2018, http://www.aec.go.jp/jicst/NC/iinkai/teirei/3-3set.pdf. It was reported that the United States called on Japan to reduce its high levels of stockpiled plutonium. "US Demands Japan Reduce its Plutonium Stockpiles," *Nikkei*, June 10, 2018, https://asia.nikkei.com/Politics/International-Relations/US-demands-Japan-reduce-its-plutonium-stockpiles.

(France, Germany, the Netherlands, Russia, the United Kingdom and the United States) jointly, have made their respective proposals.

Among those proposals, nuclear fuel banks have actually and concretely made progress. Subsequent to the establishment of the International Uranium Enrichment Centre (IUEC) in Angarsk (Russia) and the American Assured Fuel Supply, the IAEA LEU fuel bank in Kazakhstan was inaugurated in August 2017. The LEU fuel bank was mainly funded by the Nuclear Threat Initiative (NTI), Kuwait, Norway, the UAE, the United States and the EU. The IAEA LEU bank will store up to 90 tons of LEU—sufficient to run a 1,000 MW light-water reactor—in the form of uranium hexafluoride.[127] This is the first fuel bank under the direct support of the international organization: the IAEA will bear the costs of purchase and delivery of LEU; and Kazakhstan will meet the cost of LEU storage.[128] In June 2018, IAEA Director-General Amano stated that, "the Agency's internal procurement process for low enriched uranium continues and we are evaluating proposals. Our intention is that a contract, or contracts, for the supply of the LEU will be signed in 2018 and that the LEU will be delivered to the IAEA LEU Storage Facility in 2019. Negotiations on transport contracts with China, Kazakhstan and the Russian Federation are well advanced."[129] In November, the IAEA signed LEU acquisition contracts with French and Russian suppliers, and LEU transport contracts with companies in the Russia and Kazakhstan.[130]

[127] IAEA, "IAEA and Kazakhstan Sign Agreement to Establish Low Enriched Uranium Bank," August 27, 2015, https://www.iaea.org/newscenter/news/iaea-moves-ahead-establishing-low-enriched-uranium-bank-kazakhstan.

[128] "Kazakhstan Signs IAEA 'Fuel Bank' Agreement," *World Nuclear News*, May 14, 2015, http://world-nuclear-news.org/UF-Kazakhstan-signs-IAEA-fuel-bank-agreement-14051502.html.

[129] Yukiya Amano, "IAEA Director General's Introductory Statement to the Board of Governors," IAEA, June 4, 2018, https://www.iaea.org/newscenter/statements/iaea-director-generals-introductory-statement-to-the-board-of-governors-4-june-2018.

[130] "IAEA Director General's Introductory Statement to the Board of Governors," IAEA, November 22, 2018, https://www.iaea.org/newscenter/statements/iaea-director-generals-introductory-statement-to-the-board-of-governors-22-november-2018.

Chapter 3. Nuclear Security[1]

Introduction: General Overview of Nuclear Security in 2018

For the international community, securing the safety of "loose nukes" and vulnerable controlled fissile materials potentially attractive to terrorists has long been considered as an important nuclear security objective. Every country should make it a political priority to constantly strengtheng the level of its nuclear security, taking into account the lessons learned from the nuclear security summit process that ended in 2016.

In 2018, no large-scale international conference on nuclear security was held at all and information about each country's efforts toward strengthening nuclear security tended to decrease compared with the previous year. The reason for this trend is not very clear. Possible explanations may be that measures related to nuclear security have already been sufficiently implemented in each country, that the international community places less emphasis on seeing further progress, or just because political attention to nuclear security has declined. Two years have passed since the nuclear security summit process ended and since the last meeting of the International Conference on Nuclear Security. It may be necessary to wait for the next large-scale international conference on nuclear security, to be held in 2019 and organized by the IAEA, to better understand the reasons for the trend.

There have been calls for continuing focused consideration on nuclear security at multilateral fora, where high-level participants are gathered on a regular basis. It has been argued that the relationship between the three pillars of the NPT (nuclear non-proliferation, nuclear disarmament and peaceful use of nuclear power) and nuclear security should be reviewed. For example, at the 2018 NPT Preparatory Committee (PrepCom), held in April 2018, some countries noted that nuclear security should also be positioned within the broad framework of nuclear disarmament, nuclear non-proliferation and peaceful use of nuclear power. [2] In this regard, nuclear security was mentioned

[1] This chapter is written by Sukeyuki Ichimasa.

[2] Statement by South Africa on the Draft Chair's Summary at the NPT Second Prepcom, May 4, 2018, http://statements.unmeetings.org/media2/18559906/south-african-npt-statement-on-the-chairs-summary.pdf.

by a PrepCom working paper, "Vienna Issues,"[3] prepared by the Vienna Group of Ten (Australia, Austria, Canada, Denmark, Finland, Hungary, Ireland, Netherlands, New Zealand, Norway and Sweden). In addition, Australia, Canada and Spain submitted a working paper titled "Nuclear security in the Treaty on the Non-Proliferation of Nuclear Weapons."[4] In particular, the latter is a document that discusses the positioning of nuclear security from the viewpoint of the NPT as follows: "First, technological advances, which have transformed the nuclear field at a fast rate. These include advances in nuclear energy production, as well as applications of radioactive materials and sources, all of which demand increasingly specialized ways of ensuring sufficient levels of nuclear security to reduce the threat of nuclear terrorism using these new technologies. Second, the emergence of new asymmetric threats, as well as the proliferation of non-State actors with the potential to access nuclear material and technologies, has created an international situation in which nuclear security is one of the cornerstones of many countries' security policies. Third, the evolution of the non-proliferation regime itself, which is increasingly complex and rich in stakeholders and instruments."[5] It is noteworthy that this document pointed out that nuclear security is not a fourth pillar for the NPT Review Conference in 2020, but a cross-cutting issue for the existing three pillars.[6]

Various focal points for CPPNM Amendment Review Conference

While a new perspective on nuclear security was provided in this way, another thing in the spotlight was the Amendment of the Convention on the Physical Protection of Nuclear Material (CPPNM Amendment) that came into force in 2016, and the new utilization of its framework. In particular, it is noteworthy that there was an argument that the CPPNM Amendment should be effectively utilized in the context of strengthening global nuclear security as a means of regularly calling for high-level political attention.[7]

These arguments were raised by some parties at the 62nd IAEA General Conference in 2018. For example, the Netherlands pointed out that the review conference in 2021[8] will be an important moment to evaluate the implementation and adequacy of the CPPNM Amendment. The Netherlands also urged the IAEA to undertake the preparatory process promptly and encouraged all parties to engage in these

[3] NPT/CONF.2020/PC.II/WP.5.

[4] NPT/CONF.2020/PC.II/WP.14.

[5] Ibid., p. 2.

[6] Ibid., pp. 3-4.

[7] One example is as follows. Jonathan Herbach and Samantha Pitts-Kiefer, "More Work to Do: A Pathway for Future Progress on Strengthening Nuclear Security," *Arms Control Today*, October 2015, https://www.armscontrol.org/ACT/2015_10/Features/More-Work-to-Do-A-Pathway-for-Future-Progress-on-Strengthening-Nuclear-Security.

[8] Based on Article 16 of the CPPNM Amendment, a review conference will be held five years after the effective date of the Convention (May 8, 2016).

processes.[9] On the other hand, discussions have reexamined the outcome of the nuclear security summit process, in connection with seeking to strengthen nuclear security on a global scale. The report, "The Nuclear Security Summits: An Overview of State Actions to Curb Nuclear Terrorism 2010-2016," published by the Arms Control Association (ACA) and the Fissile Materials Working Group (FMWG) in 2018, evaluated many issues including the lessons learned through the past nuclear security summits. In particular, the report points out that the International Physical Protection Advisory Service (IPPAS), created by the IAEA, is an important means to complement the verification system for the CPPNM Amendment, which does not currently have its own measures to verify the status of implementation. In this regard, the report states the expectation that a "360-degree look" at physical protection, taking into consideration other instruments and resources, offering states a genuine path to continue to improve their safeguarding of nuclear material and facilities, will be given at the review conference of the Convention.[10] Another example of reviewing the heritage of the nuclear security summit process was an opinion weighing the merits and demerits of keeping the summit itself as an exclusive "minilateral negotiation forum."[11] Also, in light of the many terrorist bombing attacks that have occurred faround the world, a skeptical view was expressed about the probability of nuclear terrorism.[12] As a preceding study related to the latter argument, an article published in 2018 by Graham Allison, best-known for his classic book *Nuclear Terrorism: The Ultimate Preventable Catastrophe*, became a hot topic. While proposing a new strategy for strengthening nuclear security, Allison points out that the probability of nuclear terrorism can theoretically increase in the future based on the past efforts to reduce risk and consideration on the risk factors themselves.[13]

However, there are a lot of actual occurrences that encourage the continuation of strengthening nuclear security, such as the case of attempted

[9] Statement by Ms. Anke ter Hoeve-van Heek, Deputy Permanent Representative of the Kingdom of the Netherlands to the IAEA, September 19, 2018, https://www.iaea.org/sites/default/files/18/09/gc62-netherlands-final-statement.pdf.

[10] Kees Nederlof, "The Amended Convention on the Physical Protection of Nuclear Materials (CPPNM): What has been Achieved and What Remains to be Done," in Sara Z. Kutchesfahani, Kelsey Davenport, and Erin Connolly, "An Arms Control Association and Fissile Materials Working Group Report The Nuclear Security Summits: An Overview of State Actions to Curb Nuclear Terrorism 2010-2016," Arms Control Association website, July 2018, https://www.armscontrol.org/sites/default/files/files/Reports/NSS_Report2018_digital.pdf, pp. 10-14.

[11] Leah Matchett, "The controversial legacy of the Nuclear Security Summit," The Bulletin of the Atomic Scientists website, October 4, 2018, https://thebulletin.org/2018/10/the-controversial-legacy-of-the-nuclear-security-summit/.

[12] "Commentary Georgetown Security Studies Review: Is the Threat of Nuclear Terrorism Distracting Attention from More Realistic Threats?," RAND Cooperation website, July 27, 2018, https://www.rand.org/blog/2018/07/is-the-threat-of-nuclear-terrorism-distracting-attention.html.

[13] Graham Allison, "Nuclear Terrorism: Did We Beat the Odds or Change Them?" *PRISM*, Volume 7, No. 3, May 15, 2018, https://cco.ndu.edu/News/Article/1507316/nuclear-terrorism-did-we-beat-the-odds-or-change-them/.

nuclear terrorism in Belgium in 2016[14] and the case of a drone that was deliberately crashed into a nuclear facility in France in July 2018.[15] The attempted act of nuclear terrorism in Belgium naturally encouraged Belgian authorities to enhance physical protection and countermeasures against sabotage of nuclear facilities. Moreover, that incident and the staged drone attack are considered to be an opportunity to reconfirm the potential risk of drone and aircraft impacts on nuclear power plants, which is a prerequisite for the defense-in-depth approach. As for the latter argument, in 2018 the Nuclear Energy Institute (NEI) issued a statement by experts specifically mentioning aircraft impact assessments with regard to nuclear plants.[16] The case of the statement by the NEI is thought to engender a certain deterrent effect to a potential aircraft attacker, by redefining the existence of such threat recognition and concrete countermeasures. Of course, the IAEA, concerned states and civil-society organizations have to keep raising public opinion and media attention so that nuclear security, which is a potential countermeasure against risk of nuclear terrorism, will not be disregarded. In this sense, great expectation is put on the Review Conference of the CPPNM Amendment.

In addition, it is necessary to mention that there is also a request for the IAEA to consider the new technical aspects of nuclear security. As an example, at the 62nd IAEA General Conference, Norway raised the need for intensive consideration by the IAEA about nuclear safety and nuclear security issues concerning Transportable Reactors or Transportable Nuclear Power Plants (TNPPs). On this issue, Norway pointed out that the IAEA should clarify and consider the scope and applicability of existing requests and means for nuclear security and safety, and also requested that the IAEA conduct a comprehensive briefing on TNPPs in the fourth quarter of 2018.[17]

The role of the IAEA for nuclear security and its future expectations

Overall, the role that the IAEA plays in strengthening the level of nuclear security has expanded remarkably, and it can be said that each member country's expectations for the IAEA are increasing. Regarding the implementation of measures for nuclear security in each country, the growing awareness

[14] Patrick Malone and Jeffrey Smith, "A Terrorist Group's Plot to Create a Radioactive "Dirty Bomb": ISIS was Looking for Nuclear Materials, and Belgium was a Smart place to Hunt," The Center of Public Integrity website, February 2016, https://publicintegrity.org/national-security/a-terrorist-groups-plot-to-create-a-radioactive-dirty-bomb/.

[15] "Greenpeace Activists 'Crash' Drone into French Nuclear Plant," *AFP*, July 3, 2018, https://www.yahoo.com/news/greenpeace-activists-crash-drone-french-nuclear-plant-134507827.html; Michael Shellenberger, "If Nuclear Plants Are So Vulnerable To Terrorist Attack, Why Don't Terrorists Attack Them?" *Forbes*, July 6, 2018, https://www.forbes.com/sites/michaelshellenberger/2018/07/06/if-nuclear-plants-are-so-vulnerable-to-terrorist-attack-why-dont-terrorists-attack-them/#5842d0645877.

[16] Richard Mogagero, "4 Reasons Why U.S. Nuclear Power Plants Are Safe from Drones," NEI website, August 6, 2018, https://www.nei.org/news/2018/4-reasons-us-nuclear-plants-safe-from-drones.

[17] Norway's National Statement at the 62nd General Conference of the IAEA, September 2018, https://www.iaea.org/sites/default/files/18/09/gc62-norway-statement.pdf.

of the importance of the IAEA's efforts, including peer review through the international nuclear security review missions, has already been pointed out in the previous issues of this report.[18] Even in support of actual nuclear terrorism prevention measures, the IAEA has cooperated with large-scale events such as the 2012 European Football Championship and the 2016 Olympic Games in Rio de Janeiro. In February 2018, the IAEA agreed to cooperate in the field of nuclear security with Japan ahead of the Tokyo Olympics and Paralympic Games in 2020.[19] Moreover, as a matter of affecting the nuclear security efforts of each country, in 2018 the IAEA launched a new "Guidance on the Management of Disused Radioactive Sources,"[20] which is positioned as a supplementary guidance on the "Code of Conduct on the Safety and Security of Radioactive Sources."[21]

A number of nuclear security-related meetings involving the IAEA were held in 2018, some of which are described individually in the Section (3) of this chapter. This section provides an overview of other nuclear security-related events by the IAEA, as follows:

- Nuclear and radioactive material in transport: a "Technical Meeting on Security of Nuclear and Other Radioactive Material in Transport" was held in Vienna in July.[22]
- Nuclear safety and security interface: an "International Conference on the Challenges Faced by Technical and Scientific Support Organizations (TSOs) in Enhancing Nuclear Safety and Security" was held in Brussels, Belgium in October.[23] Also, a "Technical Meeting on the Safety and Security Interface" was held in Vienna in October.[24]
- Emergency preparedness and response: a "Workshop on Emergency Preparedness and Response" was held in Luxembourg

[18] *Hiroshima Report 2015*, p. 93.

[19] "IAEA to Cooperate with Japan on Nuclear Security at 2020 Olympic Games in Tokyo," IAEA website, February 15, 2018, https://www.iaea.org/newscenter/pressreleases/iaea-to-cooperate-with-japan-on-nuclear-security-at-2020-olympic-games-in-tokyo.

[20] Guidance on the Management of Disused Radioactive Sources (IAEA/CODEOC/MGT-DRS/2018), IAEA, 2018, https://www-pub.iaea.org/books/IAEABooks/13380/Guidance-on-the-Management-of-Disused-Radioactive-Sources.

[21] Matt Fisher, "IAEA Guidance on Managing Disused Radioactive Sources Now Available," IAEA website, July 5, 2018, https://www.iaea.org/newscenter/news/iaea-guidance-on-managing-disused-radioactive-sources-now-available.

[22] "Technical Meeting on Security of Nuclear and other Radioactive Material in Transport," IAEA website, https://www.iaea.org/events/technical-meeting-on-security-of-nuclear-and-other-radioactive-material-in-transport.

[23] "International Conference on Challenges Faced by Technical and Scientific Support Organizations (TSOs) in Enhancing Nuclear Safety and Security: Ensuring Effective and Sustainable Expertise," IAEA website, https://www.iaea.org/events/challenges-faced-by-technical-and-scientific-support-organizations-conference-2018; Nathalie Mikhailova, "Technical and Scientific Support Key for Strong Nuclear Safety and Security: IAEA Conference Opens," IAEA website, October 16, 2018, https://www.iaea.org/newscenter/news/technical-and-scientific-support-key-for-strong-nuclear-safety-and-security-iaea-conference-opens.

[24] "Technical Meeting on the Safety and Security Interface - Approaches and National Experiences," IAEA website, https://www.iaea.org/events/EVT1802553.

in December,[25] followed by a "Regional Workshop to Review the Template of the Mediterranean regional EPR plan" was held in Vienna in December.[26]

In view of the above, it is worthwhile to evaluate the situation in which concerned states are continuously involved in the IAEA's nuclear security-related events throughout the year and pursuing enhancements to their respective nuclear security systems. Through numerous regional workshops and international meetings, each country had the opportunity to share information and best practices with many stakeholders about nuclear security perception, technology, and culture. In view of the fact that nuclear security is carried out under the responsibility of each country, these opportunities represented an important achievement in promoting sustainable nuclear security initiatives.

On the other hand, as a matter of current nuclear security concerns, alarm bells continued to be sounded about cyber attacks (computer security), sabotage by drones, and insider threats that has long been regarded as a serious issue. As an example of the debate over cyber threats, *The Economist* referred to the fourth edition of "Nuclear Security Index," published by the Nuclear Threat Initiative (NTI) in 2018,[27] and evaluated the progress of efforts towards improving the level of nuclear security in many surveyed countries. Meanwhile, *The Economist* pointed out that challenges remain in strengthening cyber security, and reported that three cases of cyber attacks against nuclear-related facilities occurred in 2016 and one case occurred in 2017.[28] Even in the general context, other than nuclear security, it is pointed out that the number of cases of cyber attack revealed is the "tip of the iceberg." There is also concern that parties which suffered cyber attacks are often reluctant to disclose information lest they expose their vulnerabilities.[29] The assessment by the NTI in 2018 also valued that countries' nuclear security countermeasures against cyber threats are progressing moderately, while

[25] "Workshop on Emergency Preparedness and Response – Requirements and Practical Implementation," IAEA website, https://www.iaea.org/events/workshop-on-emergency-preparedness-and-response-requirements-and-practical-implementation.

[26] "Regional Workshop to Review the Template of the Mediterranean Regional EPR Plan," IAEA website, https://www.iaea.org/events/regional-workshop-to-review-the-template-of-the-mediterranean-regional-epr-plan.

[27] "NTI Nuclear Security Index Theft—Sabotage: Building a Framework for Assurance, Accountability, and Action (Fouth Edition)," NTI website, September 2018, https://ntiindex.org/wp-content/uploads/2018/08/NTI_2018-Index_FINAL.pdf.

[28] "Nuclear Security is Improving Almost Everywhere: Cyber-Security is a Growing Concern," *The Economist*, September 6, 2018, https://www.economist.com/graphic-detail/2018/09/06/nuclear-security-is-improving-almost-everywhere.

[29] Caroline Baylon, Roger Brunt and David Livingstone, "Chatham House Report Cyber Security at Civil Nuclear Facilities: Understanding the Risks," Chatham House website, September 2015, https://www.chathamhouse.org/sites/files/chathamhouse/field/field_document/20151005CyberSecurityNuclearBaylonBruntLivingstone.pdf.

pointing out that defense against expanding cyber threats is dangerously insufficient.[30] In strengthening nuclear security standards in the future, cyber threat countermeasures need to be pursued with high priority.

U.S. Nuclear Security Policy

The international community has paid particular attention to nuclear security policy and implementation efforts of the U.S. Trump administration, particularly in comparison to the former Obama administration, which led the nuclear security summit process that contributed to improving the global nuclear security standards. In the U.S. "Nuclear Posture Review (NPR 2018)" announced in February 2018, the term "nuclear security" was only mentioned once, in the preface by Defense Secretary Jim Mattis. On the other hand, unlike the "Nuclear Posture Review (NPR 2010)" published during the Obama administration, NPR 2018 uses the term "Countering Nuclear Terrorism" to explain deterrence and retaliation against nuclear terrorism.[31] Nevertheless, similar to the former Obama administration, which promoted multilateral cooperation and technical assistance, the NPR 2018 also emphasizes that it will "continue to work with allies and partners to disrupt proliferation networks and interdict transfers of nuclear materials and related technology" and "improve coordination with international export-control and law-enforcement agencies to bolster information sharing to detect and interdict nuclear and radiological material." It adds that, in collaboration with foreign partners, the United States will "maintain the constellation of radiation detection technologies that have been deployed in 60 countries around the world to thwart the smuggling of nuclear weapons and materials by land, sea, and air."[32] Thus, the current nuclear security policy of the United States is thought to be somewhat different in nuance from the conventional the U.S. approach that had supported the improvement of the nuclear security standards in each country.

Such a change in nuances may be a proof that the development of legal instruments and HEU minimization progress through the six-year nuclear security summit process, and that nuclear security is entering a new phase. Alternatively, such change in nuance can also be regarded as a result of repositioning nuclear security as an integral part of the fight against terrorism, as symbolized by keywords such as deterrence and retaliation. In any case, the fact that the United States addresses such a policy direction at the time when the outcomes of the nuclear security summit are being revisited and discussion is being focused on a new multilateral forum for nuclear security that will be able to attract high-level political attention, has important meaning in understanding future trends in nuclear security.

In view of the factors mentioned above, this

[30] Ernest J. Moniz, "Forward," in "NTI Nuclear Security Index Theft—Sabotage: Building a Framework for Assurance, Accountability, and Action (Fouth Edition)," NTI website, September 2018, https://ntiindex.org/wp-content/uploads/2018/08/NTI_2018-Index_FINAL.pdf, p. 4.

[31] U.S. Department of Defense, *Nuclear Posture Review*, February 2018, pp. XV-XVI.

[32] Ibid., p. 67.

report surveys the following items to evaluate the implementation of nuclear security-related measures of each country. In order to assess the nuclear security risks of each country, this report considers: indicators of the presence of nuclear material that may be "attractive" for malicious intent, facilities that produce such material, and related activities. It also examines the accession status to nuclear security-related international conventions, the implementation status of existing nuclear security measures and proposals to enhance them, and official statements related to nuclear security approaches, in order to evaluate the nuclear security performance and status of each county.

(1) Physical Protection of Nuclear Materials and Facilities

Regarding the definition of nuclear security, the 2015 edition of the IAEA Nuclear Security Series Glossary states: "the prevention of, detection of, and response to, criminal or intentional unauthorized acts involving or directed at nuclear material, other radioactive material, associated facilities, or associated activities."[33] According to the IAEA definition, a nuclear security threat is "a person or group of persons with motivation, intention and capability to commit criminal or intentional unauthorized acts involving or directed at nuclear material, other radioactive material, associated facilities or associated activities or other acts determined by the state to have an adverse impact on nuclear security."[34] The IAEA recommends that the state's physical protection requirements for nuclear material and nuclear facilities should be based on a Design Basis Threat (DBT), specifically for unauthorized removal of Category I nuclear material, sabotage of nuclear material and nuclear facilities that have potentially high radiological consequences.[35] Furthermore, the IAEA recommended that security requirements for radioactive material "should be adopted depending on whether the radioactive material concerned is sealed source, unsealed source, disused sealed source or waste, and should cover transport."[36]

The latest version of the IAEA's "Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities" (INFCIRC/225/Rev.5) was revised and published in 2011. In this revised edition, the IAEA recommends that requirements for physical protection should be based on a graded approach, taking into account the current evaluation of the threat, the relative attractiveness, the nature of the nuclear material and potential consequences associated with the unauthorized removal of nuclear

[33] Nuclear Security Series Glossary Version 1.3 (November 2015). Updated, International Atomic Energy Agency, http://www-ns.iaea.org/downloads/security/nuclear-security-series-glossary-v1-3.pdf, p. 18.

[34] IAEA Nuclear Security Series No.20, "Objective and Essential Elements of a State's Nuclear Security Regime," 2013, http://www-pub.iaea.org/MTCD/Publications/PDF/Pub1590_web.pdf.

[35] IAEA Nuclear Security Series No.13, "Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities (INFCIRC/225/Revision 5)," 2011, p. 13.

[36] IAEA Nuclear Security Series No.14, "Nuclear Security Recommendations on Radioactive Material and Associated Facilities," 2011, p. 14.

material and with the sabotage against nuclear material or nuclear facilities.[37] The IAEA also suggests that "the physical protection system should be designed to deny unauthorized access of persons or equipment to the targets, minimize opportunity of insiders, and protect the targets against possible stand-off attacks consistent with the state's threat assessment or design basis threat."[38] In other words, the system should protect against attacks that are executed at a distance from the target nuclear facility or transport and that do not require adversary hands-on-access to the target, or require the adversary to overcome the physical protection system. The objectives of the state's physical protection regime, which is an essential component of the state's nuclear security regime, should be to protect against unauthorized removal, to locate and recover missing nuclear material, protect against sabotage, and mitigate or minimize effects of sabotage.[39]

The nuclear material itself is the primary factor for determining the physical protection measures against unauthorized removal. Therefore, categorization based on the different types of nuclear material in terms of element, isotope, quantity and irradiation is the basis for a graded approach for protection against unauthorized removal of "attractive" nuclear material that could be used in a nuclear explosive device, which itself depends on the type of nuclear material, isotopic composition, physical and chemical form, degree of dilution, radiation level, and quantity (see Table 3-1). [40]

Generally, plutonium with an isotopic concentration of plutonium 239 of 80% or more is more attractive than other plutonium isotopes from a standpoint of manufacturing nuclear explosive devices by terrorists. Weapons-grade HEU is usually enriched to 90% or higher levels of U-235. Both of these high-grade nuclear materials require high-level protection measures. In assessing the importance of preventing illegal transfers and sabotage, even if countries do not possess weapons-grade HEU or plutonium, they are at risk if they possess a uranium enrichment facility or a nuclear reactor and a plutonium reprocessing facility. The number of such sensitive facilities in a country will be the subject of assessment for a state's effort in enhancing nuclear security. Of course, the level of these protection measures will vary depending on the geopolitical circumstance or the domestic security situation. Table 3-2 shows the latest evaluations made by the the International Panel on Fissile Materials (IPFM) and by other relevant research bodies, including the NTI in its "Civilian HEU Dynamic Map," of nuclear material holdings.

[37] INFCIRC/225/Rev.5, paragraph 3.37.
[38] Ibid., paragraph 5.14.
[39] Ibid., paragraph 2.1.
[40] Ibid., paragraph 4.5.

Table 3-1: Categorization of Nuclear Material*

Material	Form	Category I High	Category II Attractiveness	Category III[c] Low
1. Plutonium[a]	Unirradiated[b]	≧ 2kg	2kg > > 500g	500g ≧ > 15g
2. Uranium-235 (^{235}U)	Unirradiated[b] — Uranium enriched to 20% ^{235}U or more	≧ 5kg	5kg > > 1kg	1kg ≧ > 15g
	— Uranium enriched to 10% ^{235}U but less than 20% ^{235}U	-----	≧ 10kg	10kg > > 1kg
	— Uranium enriched above natural, but less than 10% ^{235}U	------	------	≧ 10kg
3. Uranium-233 (^{233}U)	Unirradiated[b]	≧ 2kg	2kg > > 500g	500g ≧ > 15g
4.Irradiated fuel**			Depleted or natural uranium, thorium or low enriched fuel (less than 10% fissile content) [d/e]	

*: This is “special fissionable material” or “source material” that is defined in Statute of the IAEA. The Statute defines “special fissional material” as plutonium-239; uranium-233; uranium enriched in the isotopes 235 or 233; any material containing one or more of the foregoing; any such other fissionable material as the Board of Governors shall from time to time determine; but the term “special fissionable material” does not include source material. It also defines “source material” as uranium containing the mixture of isotopes occurring in nature; uranium depleted in the isotope 235; thorium; any of the foregoing in the form of metal, alloy, chemical compound, or concentrate; any other material containing one or more of the foregoing in such concentration as the Board of Governors shall from time to time determine; and such other material as the Board of Governors shall from time to time determine. International Atomic Energy Agency (IAEA), “Statute,” As Amended up to 23 February 1989.

**: The categorization of irradiated fuel in the table is based on international transport considerations. The State may assign a different category for domestic use, storage and transport taking all relevant factors into account.

a) All plutonium except that unattractive plutonium with isotopic concentration exceeding 80% in plutonium-238.

b) Material not irradiated in a reactor or material irradiated in a reactor but with a radiation level equal to or less than 1 Gy/h. (100 rad/h) at 1 m unshielded.

c) Quantities not falling in Category III and natural uranium, depleted uranium and thorium should be protected at least in accordance with prudent management practice.

d) Although this level of protection is recommended, it would be open to States, upon evaluation of the specific circumstances, to assign a different category of physical protection.

e) Other fuel which by virtue of its original fissile material content is classified as Category I or II before irradiation may be reduced one category level while the radiation level from the fuel exceeds 1 Gy/h (100 rad/h) at one metre unshielded.

Source: IAEA, “Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities (INFCIRC/225/Revision 5),” IAEA Nuclear Security Series No. 13, 2011. This table was originally shown in the *Hiroshima Report 2014*, p.68.

Even today, HEU and plutonium equivalent to nearly 200,000 nuclear weapons exist in the whole world.[41] Furthermore, more than 90% of the global HEU and weapon-grade plutonium stockpile is possessed by the United States and Russia. For terrorists who may be intent on acquiring material for nuclear weapons, these and other fissile material holdings can be considered to present the most attractive targets. While the global stockpile of HEU and separated plutonium has been occupying the attention of the international community and civil society, there is little officially disclosed information about stockpiles of HEU and weapon-grade plutonium by individual states, due to the sensitivity of these materials.

In spite of these constraints, transparency of nuclear material holdings is important, in principle. According to the NTI's "Civilian HEU Dynamic Map,"[42] the estimated holdings of HEU and plutonium of some countries other than the ones in Table 3-2 are estimated as follows:

- Countries assumed to retain approximately 1 ton of HEU (category I is 5 kg and more): Kazakhstan(10,470-10,777kg), Canada (1,038kg)
- Countries assumed to retain 1 kg and more but less than 1 ton of HEU: Australia (2kg), Iran (6kg), the Netherlands (550-650kg), Norway (1-9kg), South Africa (700-750 kg (unspecified)), Syria (less than 1 kg)

As a result of activities of the recent Global Threat Reduction Initiative (GTRI), the number of countries that completely removed HEU has increased in recent years. Argentina, Austria, Brazil, Bulgaria, Chile, Columbia, Czech Republic, Denmark, Georgia, Ghana, Greece, Hungary, Indonesia, Iraq, Jamaica, Latvia, Libya, Mexico, Nigeria, Philippines, Poland, Portugal, South Korea, Romania, Serbia, Slovenia, Spain, Sweden, Switzerland, Thailand, Turkey, Ukraine, Uzbekistan, Vietnam, etc. are cited as countries that achieved complete removal of such HEU.[43] For reference information, estimated holdings of HEU and plutonium of some countries not in the list of this survey are as follows:

- Countries assumed to retain 1 kg and more but less than 1 ton of HEU: Belarus (80-280 kg), Italy (100-119 kg)[44]

Any operating reactor or facility for handling spent fuel presents a potential risk of illicit transfer of fissile material or sabotage against facility. Research reactors can pose a greater risk

[41] Zia Mian and Alexander Glaser, "Global Fissile Material Report 2015: Nuclear Weapon and Fissile Material Stockpile and Production," NPT Review Conference, May 8, 2015, http://fissilematerials.org/library/ipfm15.pdf. While HEU stocks are decreasing, plutonium stocks are increasing, mainly due to increased inventory of civilian plutonium.

[42] NTI, "Civilian HEU Dynamic Map," Nuclear Threat Initiative website, November 2018, https://www.nti.org/gmap/other_maps/heu/index.html.

[43] Ibid; Chuck Messick, et.al., "Global Threat Reduction Initiative: U.S.-Origin Nuclear Fuel Removals," U.S. Department of Energy website, https://www.energy.gov/sites/prod/files/em/GlobalThreatReductionInitiative.pdf.

[44] Ibid.

Table 3-2: Stockpiles of nuclear material usable for weapons

[Metric Tons]

	China	France	Russia	U.K.	U.S.	India
HEU	**14±3**	**(max) 30.6**	**679**	**21.2**	**574.5**	**4.0**
・Stockpile available for weapons		26, or maximum 10±2, minimum 6±2				
・Naval (fresh)						
・Naval (irradiated)						
・Civilian Material						
・Excess (mostly for blend-down)						
Weapon Pu	**2.9±0.6**	**6**	**128**	**3.2**	**80.8**	**6.58**
・Military stockpile		6		3.2		
・Excess military material						
・Additional strategic stockpile						
Civilian use Pu	**0.04**	**65.4**	**59**	**110.3**	**7.0**	**0.4**
・Civilian stockpile, stored in country						0.4
・Civilian stockpile, stored outside country						

	Israel	Pakistan	Belgium	Germany	Japan	Switzerland	N. Korea	Others
HEU	**0.3**	**3.4**	**0.7-0.727**	**1.27**	**1.75**	**0**	**0.042**	**15**
・Stockpile available for weapons								
・Naval (fresh)								
・Naval (irradiated)								
・Civilian Material							0.042	15
・Excess (mostly for blend-down)								
Weapon Pu	**0.9**	**0.28**					**0.03**	
・Military stockpile							0.03	
・Excess military material								
・Additional strategic stockpile								
Civilian use Pu			**< 0.05**	**0**	**47.3**	**< 0.002**		**49.3**
・Civilian stockpile, stored in country					10.5			
・Civilian stockpile, stored outside country					36.7			

[The blanks indicate that there is no information and details are unknown.]

Sources:https://www.iaea.org/sites/default/files/publications/documents/infcircs/1998/infcirc549a9-20.pdf;INFCIRC/549/Add.4/22(Corrected), April 3, 2018, https://www.iaea.org/sites/default/files/publications/documents/infcircs/1998/infcirc549a4-22c.pdf; INFCIRC/549/Add.3/17, July 5, 2018, https://www.iaea.org/sites/default/files/publications/documents/infcircs/1998/infcirc549a3-17.pdf; INFCIRC/549/Add.2/21, September 6, 2018, https://www.iaea.org/sites/default/files/publications/documents/infcircs/1998/infcirc549a2-21.pdf; "China's Fissile Material Production and Stockpile New IPFM report," IPFM Blog, January 12, 2018, http://fissilematerials.org/blog/2018/01/chinas_fissile_material_p.html; International Panel on Fissile Materials, "Fissile Materials Stocks," International Panel on Fissile Materials, February 12, 2018, http://fissilematerials.org/; "Civilian HEU Dynamic Map," Nuclear Threat Initiative website, November 2018, http://www.nti.org/gmap/other_maps/heu/; "The Status Report of Plutonium Management in Japan 2017," Office of Atomic Energy Policy Cabinet Office, July 31, 2018, http://www.aec.go.jp/jicst/NC/about/kettei/180731_e.pdf, p.2.

if they utilize HEU fuel and if they are associated with spent-fuel reprocessing facilities or even unsecured storage of spent fuel.

The IAEA's Research Reactor Database (RRDB) [45] shows that 226 out of a total of 841 research reactors are currently in operation (140 in developed countries, 86 in developing countries). Another 13 reactors (eight in developed countries, five in developing countries) are temporarily shut down, nine reactors (four in developed countries, five in developing countries) are under construction, 14 reactors (two in developed countries, 12 in developing countries) are scheduled for construction, 56 reactors (42 in developed countries, 14 in developing countries) have been permanently shut down, 443 reactors (413 in developed countries, 30 in developing countries) are decommissioned, and construction of 16 reactors (12 in developed countries, four in developing countries) have been canceled. Compared with the previous year, the number of research reactors increased by 70 in the whole world, while the number of research reactors with permanent shutdown status decreased to 55 in developed countries. In addition, the number of research reactors that were decommissioned increased by 81 in total.

According to the IAEA, 20,663 spent fuel assemblies from research reactors are enriched to levels above 20% and 9,532 of these stored fuel assemblies are enriched to levels at or above 90%.[46] The figures for these spent fuel assemblies have not changed at all since last year, as follows. In terms of geographical distribution: 10,627 spent HEU fuel assemblies, which are over half of the total, are currently stored in Eastern Europe, 572 are located in Africa and Middle East, 3,492 in Asia, 4,273 in Western Europe, 85 in Latin America and 1,614 in North America. [47] Given this situation, prevention of illegal transfers and sabotage against facilities becomes critically important as a measure against nuclear security risk, regardless of whether or not the reactor is in operation.

Table 3-3 outlines the presence of nuclear power plants, research reactors, uranium enrichment facilities, and reprocessing facilities in surveyed countries, as risk indicators.

The IAEA recommends that a state defines the risk based on the amount, forms, composition, mobility, and accessibility of nuclear and other radioactive material and takes prospective measures against the defined risk. In terms of unauthorized removal, nuclear or other radioactive material and related production

[45] IAEA, Research Reactor Data Base, IAEA website, https://nucleus.iaea.org/RRDB/RR/ReactorSearch.aspx?rf=1.

[46] IAEA, Worldwide HEU and LEU assemblies by Enrichment, IAEA website, https://nucleus.iaea.org/RRDB/Reports/Container.aspx?Id=C2.

[47] IAEA, Regionwise distribution of HEU and LEU, IAEA website, https://nucleus.iaea.org/RRDB/Reports/Container.aspx?Id=C1.

Table 3-3: Nuclear fuel cycle facilities

	Nuclear Power Plant	Research Reactor	Uranium Enrichment Facility	Reprocessing Facility
China	○	○	○	○
France	○	○	○	○
Russia	○	○	○	○ b
U.K.	○	○	○	○
U.S.	○	○	○	○
India	○	○	○ a	○ b
Israel		○	?	○ a
Pakistan	○	○	○ b	○ a
Australia		○		
Austria		○		
Belgium	○	○		
Brazil	○	○	○	
Canada	○	○		
Chile		○		
Egypt		○		
Germany	○	○	○	
Indonesia		○		
Iran	○	○	○	
Japan	○	○	○	△ e
Kazakhstan	○ d	○		
South Korea	○	○		
Mexico	○	○		
Netherlands	○	○	○	
New Zealand				
Nigeria		○		
Norway		○		
Philippine		△ d		
Poland		○		
Saudi Arabia		△ c		
South Africa	○	○	△ d	
Sweden	○	△ d		
Switzerland	○	○		
Syria		○		
Turkey	△ c	○		
UAE	△ c			
North Korea		○ a	△ c	△ a

○: Currently operated, △: Un-operated

a) Military use/ b) Military and civilian use/ c) Under construction/ d) Under shut down and decommissioning/ e) Under test operation

Source: IAEA, Research Reactor Database, IAEA website, https://nucleus.iaea.org/RRDB/RR/ReactorSearch.aspx?filter=0; IAEA INFCIS Nuclear Fuel Cycle Information System, IAEA website, https://infcis.iaea.org/NFCIS/NFCISCountryReport; IAEA, Power Reactor Information System, IAEA website, https://www.iaea.org/PRIS/home.aspx; "Processing of Used Nuclear Fuel," World Nuclear Association website, June 2018, http://www.world-nuclear.org/information-library/nuclear-fuel-cycle/fuel-recycling/processing-of-used-nuclear-fuel.aspx; "Countries: Israel," International Panel on Fissile Materials website, February 12, 2018, http://fissilematerials.org/countries/israel.html; "Brazil increases by 25% the production of enriched uranium," INB website, September 10, 2018, http://www.inb.gov.br/en-us/Detalhe/Conteudo/brazil-increases-by-25-the-production-of-enriched-uranium/Origem/772; "Nuclear Power in Belgium," World Nuclear Association website, September 2018, http://www.world-nuclear.org/information-library/country-profiles/countries-a-f/belgium.aspx; "Nuclear Power in Iran," World Nuclear Association website, April 2018, http://www.world-nuclear.org/information-library/country-profiles/countries-g-n/iran.aspx.

facilities are also potential targets.[48] To reduce the potential for sabotage within a plant, the IAEA recommends that a state "establishes its threshold(s) of unacceptable radiological consequences" and identifies the vital areas where risk associated materials, devices, and functions are located and designated "in order to determine appropriate levels of physical protection taking into account existing nuclear safety and radiation protection."[49]

In recent years, efforts are also being made regarding nuclear security of radioactive sources. In this field, the IAEA publishes "Nuclear Security Series No.11, Security of Radioactive Sources (2009)"[50] and "Nuclear Security Series No.14, Nuclear Security Recommendations on Radioactive Material and Associated Facilities (2011)."[51] Also, at the Washington Nuclear Security Summit in 2016, 28 countries and INTERPOL jointly released a "Gift Basket" statement on strengthening the security of high-activity sealed radioactive sources, reflecting the IAEA's Code of Conduct on the Safety and Security of Radioactive Sources.[52] Regarding the individual efforts of each country related to security of radioactive sources, the "Second Technical Meeting on Radiation Detection Instruments for Nuclear Security" was held in Vienna in April.[53] The meeting brought 135 representatives from 71 Member States and more than 70 representatives from equipment manufacturers and vendors together for discussions on topics such as air cargo detection operations, maintenance challenges and the role of drones and artificial intelligence.[54] In addition, the "2018 annual meeting of the Working Group on Radioactive Source Security" was held at the IAEA in April.[55] Also, the "International Conference on the Security of Radioactive Material" was held by the IAEA in Vienna in December. The purpose of the conference was to foster the exchange of practices and experiences related to the security of radioactive material under regulatory control in use, transport and storage, and to the system

[48] IAEA Nuclear Security Series No. 14, "Nuclear Security Recommendations on Radioactive Material and Associated Facilities," 2011, http://www-pub.iaea.org/MTCD/publications/PDF/Pub1487_web.pdf.

[49] Ibid., p. 14.

[50] IAEA Nuclear Security Series No. 11, "Security of Radioactive Sources," 2009, http://www-pub.iaea.org/MTCD/publications/PDF/Pub1387_web.pdf.

[51] IAEA Nuclear Security Series No. 14.

[52] "Joint Statement Strengthening the Security of High Activity Sealed Radioactive Sources (HASS)," 2016 Washington Nuclear Security Summit, March 11, 2016, https://static1.squarespace.com/static/568be36505f8e2af8023adf7/t/57050be927d4bd14a1daad3f/1459948521768/Joint+Statement+on+the+Security+of+High+Activity+Radioactive+Sources.pdf.

[53] Second Technical Meeting on Radiation Detection Instruments for Nuclear Security: Trends, Challenges and Opportunities, IAEA website, April 16-20, 2018, https://www.iaea.org/events/second-technical-meeting-on-radiation-detection-instruments-for-nuclear-security-trends-challenges-and-opportunities.

[54] Catherine Friedly, "IAEA Meeting on Radiation Detection Instruments Highlights Role of Science, Technology and Engineering in Nuclear Security," IAEA website, April 24, 2018, https://www.iaea.org/newscenter/news/iaea-meeting-on-radiation-detection-instruments-highlights-role-of-science-technology-and-engineering-in-nuclear-security.

[55] Catherine Friedly, "IAEA Working Group on Radioactive Source Security Fosters Experience Sharing to Enhance Nuclear Security," IAEA website, May 11, 2018, https://www.iaea.org/newscenter/news/iaea-working-group-on-radioactive-source-security-fosters-experience-sharing-to-enhance-nuclear-security.

and measures for detection of this material out of regulatory control.[56] At the conference, over 550 participants from more than 100 countries and 15 organizations discussed how to best secure radioactive material, which is widely used in medicine, agriculture and scientific research.[57]

(2) Status of Accession to Nuclear Security and Safety-Related Conventions, Participation in Nuclear Security-Related Initiatives, and Application to Domestic Systems

A) Accession status to nuclear security-related conventions

This section examines the accession status of each country to the following nuclear security and safety-related conventions that are mentioned in the Nuclear Security Summit communiqué,[58] namely: the Convention on the Physical Protection of Nuclear Material (CPPNM); Amendment to CPPNM (CPPNM Amendment); the International Convention for the Suppression of Acts of Nuclear Terrorism (Nuclear Terrorism Convention); the Convention on Nuclear Safety (Nuclear Safety Convention); the Convention on Early Notification of a Nuclear Accident; the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management; and the Convention on Assistance in the Case of Nuclear Accident or Radiological Emergency.

- The CPPNM became effective in 1987. As of August 2018, 157 countries have signed this treaty.[59] The CPPNM requires its party states to take appropriate protection measures for international transfer of nuclear material used for peaceful purposes, and not permit its transfer in the case that such measures are not in place. It also calls for the criminalization of acts including unauthorized receipt, possession, use, transfer, alteration, disposal or dispersal of nuclear material, and which cause damage to any person or property, as well as theft or robbery of nuclear material.
- The CPPNM Amendment became effective in 2016. As of July 2018, 118 states have approved the Amendment.[60] The Amendment makes it legally binding

[56] "International Conference on the Security of Radioactive Material: The Way Forward for Prevention and Detection," IAEA website, December 3-7, 2018, https://www.iaea.org/events/security-of-radioactive-material-conference-2018.

[57] Inna Pletukhina, "Cooperation, Coordination, and Communication Key to Securing Radioactive Material: IAEA Conference," IAEA website, December 14, 2018, https://www.iaea.org/newscenter/news/cooperation-coordination-and-communication-key-to-securing-radioactive-material-iaea-conference.

[58] "Nuclear Security Summit 2016 Communiqués," 2016 Washington Nuclear Security Summit, April 1, 2016.

[59] Multilateral agreements in nuclear energy II. Non-proliferation and nuclear security: Convention on the Physical Protection of Nuclear Material (CPPNM), OECD NEA website, August 6, 2018, https://www.oecd-nea.org/law/multilateral-agreements/convention-protection-material.html.

[60] Amendment to the Convention on the Physical Protection of Nuclear Material, July 25, 2018, https://www-legacy.iaea.org/Publications/Documents/Conventions/cppnm_amend_status.pdf.

for states to establish, implement and maintain an appropriate physical protection regime applicable to nuclear material and nuclear facilities under their jurisdiction. It provides for the criminalization of new and extended specified acts, and requires countries to put in place measures to protect nuclear material and nuclear facilities against sabotage. In this sense, the Amendment expands the existing offences identified in the CPPNM, including the theft and robbery of nuclear material, and establishes new ones, such as the smuggling of nuclear material and the actual or threatened sabotage of nuclear facilities. A number of the offences were also expanded to include substantial damage to the environment. As the only legally binding international undertaking in the area of physical protection of nuclear material, ratification of the Amendment should be continuously promoted.

- The Nuclear Terrorism Convention entered into force in 2007. As of December 2018, the number of parties is 114.[61] The convention requires party states to criminalize acts of possession and use of radioactive material[62] or nuclear explosive devices with malicious intent, and against those seeking to use and damage nuclear facilities in order to cause radioactive dispersal. The convention and the CPPNM Amendment are mutually necessary to support a legal framework for nuclear security.
- The Nuclear Safety Convention entered into force in 1996. As of October 2018, the number of parties is 85.[63] This treaty is aimed at ensuring and enhancing the safety of nuclear power plants. Party states of this convention are required to take legal and administrative measures, report to the review committee established under this convention, and accept peer review in order to ensure the safety of nuclear power plants under their jurisdiction.
- The Convention on Early Notification of a Nuclear Accident entered into force in 1986. As of September 2018, the number of parties is 122.[64] It obligates its party states to immediately report to the IAEA when a nuclear accident has occurred, including the type, time, and location of the accident and relevant information.
- The Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management

[61] "Status of Treaties: International Convention for the Suppression of Acts of Nuclear Terrorism," United Nations Treaty Collections website, https://treaties.un.org/Pages/ViewDetailsIII.aspx?src=TREATY&mtdsg_no=XVIII-15&chapter=18&Temp=mtdsg3&lang=en.

[62] International Convention for the Suppression of Acts of Nuclear Terrorism, United Nations, 2005, https://treaties.un.org/doc/db/terrorism/english-18-15.pdf, Article 1.

[63] "Convention on Nuclear Safety," IAEA website, July 3, 2018, http://www-legacy.iaea.org/Publications/Documents/Conventions/nuclearsafety_status.pdf.

[64] "Convention on Early Notification of a Nuclear Accident," IAEA website, September 17, 2018, https://www-legacy.iaea.org/Publications/Documents/Conventions/cenna_status.pdf.

entered into force in 2001. As of August 2018, the number of parties is 80.[65] It calls for its member states to take legal and administrative measures, report to its review committee, and undergo peer review by other parties, for the purpose of ensuring safety of spent fuel and radioactive waste.

- The Convention on Assistance in the Case of Nuclear Accident or Radiological Emergency entered into force in 1987. As of September 2018, the number of parties is 117.[66] This convention establishes the international framework that enables equipment provision and dispatch of experts with the goals of preventing and/ or minimizing nuclear accidents and radioactive emergencies.

Some, if not all, of these nuclear safety-related conventions can be interpreted as providing protective measures for nuclear security purposes, and thus could be listed as nuclear security-related international conventions. Table 3-4 summarizes the signature and ratification status of each country to these conventions.

B) INFCIRC/225/Rev.5

The latest version of "Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities" as of 2018 is INFCIRC/225/Rev.5, published by IAEA in 2011. In comparison with the INFCIRC/225/Rev.4,[67] this latest revision introduced new measures on nuclear security: inter alia, creation of limited access areas, graded approaches, the enhancement of defense-in-depth, and protection against "Stand-off Attack" and airborne threat, counter measures against insider threat, development of nuclear security culture as a preventive measure against security breaches by insiders, and the provision of redundancy measures to ensure the functions of the central response station during an emergency. Implementation of the protective measures in accordance with the recommendation made by this fifth revision has been encouraged internationally, with a view to establishing a stronger nuclear security system. Furthermore, this revision stipulates a number of state responsibilities for establishing contingency plans, including interfaces with safety, as appropriate, ensuring that the operator prepares contingency plans to effectively counter the threat assessment or DBT taking actions of the response forces into consideration, evaluating effectiveness of the physical protection system through exercises, and determining the trustworthiness policy.

Since the INFCIRC/225/Rev.5 was released at the same time as the start of the nuclear security

[65] Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, IAEA website, August 16, 2018, https://www-legacy.iaea.org/Publications/Documents/Conventions/jointconv_status.pdf.

[66] Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, IAEA website, September 17, 2018, https://www-legacy.iaea.org/Publications/Documents/Conventions/cacnare_status.pdf.

[67] "The Physical Protection of Nuclear Material," IAEA website, https://www.iaea.org/publications/documents/infcircs/physical-protection-nuclear-material.

Table 3-4: Signature and ratification status for major nuclear security- and safety-related conventions

	CPPNM	CPPNM Amendment	Nuclear Terrorism Convention	Nuclear Safety Convention	Convention on Early Notification of a Nuclear Acciden	Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management	Convention on Assistance in the Case of Nuclear Accident or Radiological Emergency
China	○	○	○	○	○	○	○
France	○	○	○	○	○	○	○
Russia	○	○	○	○	○	○	○
U.K.	○	○	○	○	○	○	○
U.S.	○	○	○	○	○	○	○
India	○	○	○	○	○		○
Israel	○	○	△	△	○		○
Pakistan	○	○		○	○		○
Australia	○	○	○	○	○	○	○
Austria	○	○	○	○	○	○	○
Belgium	○	○	○	○	○	○	○
Brazil	○		○	○	○	○	○
Canada	○	○	○	○	○	○	○
Chile	○	○	○	○	○	○	○
Egypt	△		△	△	○		○
Germany	○	○	○	○	○	○	○
Indonesia	○	○	○	○	○	○	○
Iran					○		○
Japan	○	○	○	○	○	○	○
Kazakhstan	○	○	○	○	○	○	○
South Korea	○	○	○	○	○	○	○
Mexico	○	○	○	○	○	○	○
Netherlands	○	○	○	○	○	○	○
New Zealand	○	○	○		○		○
Nigeria	○	○	○	○	○	○	○
Norway	○	○	○	○	○	○	○
Philippine	○		△	△	○	△	○
Poland	○	○	○	○	○	○	○
Saudi Arabia	○	○	○	○	○	○	○
South Africa	○		○	○	○	○	○
Sweden	○	○	○	○	○	○	○
Switzerland	○	○	○	○	○	○	○
Syria			△	○	○		○
Turkey	○	○	○	○	○		○
UAE	○	○	○	○	○	○	○
North Korea					△		△

○: Ratification, acceptance, approval, and accession △: Signature

summit, when participating in the Summit, countries tended to announce the introduction of physical protection measures in accordance with the fifth revision of the recommendation. This trend continued until the last nuclear security summit in 2016.[68]

In this regard, the application status of the recommended measures of INFCIRC/225/Rev.5 can serve as a significant indicator to assess the nuclear security system of this report's surveyed countries. This report refers to official statements made available in the 62nd IAEA General Conference and the 2018 NPT PrepCom, as well as other opportunities to evaluate the national nuclear security stance and performance of each state.

Application Status of Each Country of the Measures Recommended in INFCIRC/225/Rev.5

As a result of the end of the nuclear security summit, held four times over seven years, opportunities for disseminating information on the introduction and application of the recommendation measures of INFCIRC/225/Rev.5 are gradually decreasing. The reason for the reduction of information dissemination is not entirely clear. It may be because there are few items to be newly added in each country with regard to INFCIRC/225/Rev.5, which, at the time of preparing this report, had been announced eight years earlier. Or it may be because opportunities to mention the application of the recommendation measures themselves have diminished as a result of shrinking occasions to disseminate information. As mentioned earlier, it may be necessary to take into consideration that no large-scale international conference on nuclear security was held in 2018. The cases where there were statements on the introduction of recommendation measures of INFCIRC225/Rev.5, directly or indirectly in the surveyed countries, are as follows.

In the field of the development of legal instruments, Indonesia received the legislative support of the IAEA and revised the Act Number 10 of 1997 on Nuclear Energy for nuclear safety, nuclear security, safeguards, investigation and prosecution of authority related to nuclear terrorism countermeasures.[69] Nigeria announced that nuclear security is included in the Country Program Framework (CPF) from 2018 to 2023, which is expected to be approved by Congress.[70] Saudi Arabia announced the implementation of the National Atomic Energy Program, which complies with the highest standards of nuclear safety, security and transparency, in accordance

[68] "Highlights of National Progress Reports," 2016 Washington Nuclear Security Summit, April 5, 2016, http://www.nss2016.org/news/2016/4/5/highlights-from-national-progress-reports-nuclear-security-summit.

[69] Statement by Dr. Darmansjah Djumala, Ambassador Extraordinary and Plenipotentiary/Permanent Representative of the Republic of Indonesia at the 62nd General Conference of the IAEA, September 2018, https://www.iaea.org/sites/default/files/18/09/gc62-indonesia-statement.pdf.

[70] Nigeria's Country Statement Delivered by his Excellency Mr. Ibrahim Usman Jibril, Honourable Minister of State for Environment at the 62nd General Conference of the IAEA, September 2018, https://www.iaea.org/sites/default/files/18/09/gc62-nigeria-statement.pdf.

with existing international treaties, protocols and best practices.[71] Sweden announced that it is updating the legal framework regarding its nuclear program, including the Radiation Protection Act and Act on Nuclear Activities, taking into account the modifications of European Legislation with the aim of making it more understandable for nuclear safety, nuclear security and radiation protection regulations for the licensees.[72]

Protection measures for sabotage actions against nuclear materials and related facilities are as follows. Belgium promoted replacement from military guards to specially trained armed police units, as a security enhancement measure for domestic nuclear sites.[73] Brazil regularly carried out domestic nuclear safety and security exercises, and also participated in activities for emergency preparedness and response by the IAEA.[74] The Netherlands held a "Regional workshop on the physical protection of nuclear material and nuclear facilities" in cooperation with the IAEA in October, aiming to effectively deal with threats such as radiological sabotage and theft of nuclear material.[75] Mexico also hosted a regional training course with the IAEA focused on protection of nuclear facilities and material against sabotage in August. Experts from 11 countries in Latin America region participated in the course, and conducted training using interactive sessions and simulated facilities.[76]

Regarding response to cyber threats, Germany supported IAEA efforts to embed computer security provisions into the IAEA's recommendations level documents and to step up capacity building in this regard.[77]

[71] Statement of the Head of Delegation of The Kingdom of Saudi Arabia H.E. Khalid A. Al-Falih, Minister of Energy, Industry, and Mineral Resources at the IAEA 62nd General Conference, September 2018, https://www.iaea.org/sites/default/files/18/09/gc62-saudi-arabia-statement_en.pdf.

[72] Sweden Statement by H.E. Ambassador Mikaela Kumlin Granit at the 62nd General Conference of the IAEA, September 2018, https://www.iaea.org/sites/default/files/18/09/gc62-sweden-statement.pdf.

[73] S.E. Pieter De Crem, Secrétaire d'Etat au Commerce extérieur, Declaration Nationale De La Belgique 62ème Session De La Conférence Générale De L'aiea, Septembre 18, 2018, https://www.iaea.org/sites/default/files/18/09/gc62-belgium-statement.pdf.

[74] Statement by H.E. Ambassador Marcel Biato, Permanent Representative of Brazil to the IAEA and PrepCom-CTBTO at the 62nd IAEA General Conference, September 17-21, 2018, https://www.iaea.org/sites/default/files/18/09/gc62-brazil-statement.pdf.

[75] Statement by Ms. Anke ter Hoeve-van Heek, Deputy Permanent Representative of the Kingdom of the Netherlands to the IAEA, September 19, 2018, https://www.iaea.org/sites/default/files/18/09/gc62-netherlands-final-statement.pdf.

[76] Nanako Kogiku, "IAEA Training for Latin American Countries Focuses on Protection of Nuclear Facilities and Material Against Sabotage," IAEA website, September 13, 2018, https://www.iaea.org/newscenter/news/iaea-training-for-latin-american-countries-focuses-on-protection-of-nuclear-facilities-and-material-against-sabotage.

[77] Statement by Thorsten Herdan, Director General Federal Ministry for Economic Affairs and Energy at the 62nd General Conference of the IAEA, September 18, 2018, https://www.iaea.org/sites/default/files/18/09/gc62-germany-statement.pdf.

Table 3-5: Application status and efforts for recommended measures of INFCIRC/225/Rev.5

A country in which information has been obtained from open source about the application status and efforts for the recommended measures, or the implementation of the recommended measures has been announced.	China, France, Russia, the U.K., the U.S., India, Israel, Pakistan, Australia, Belgium, Brazil, Canada, Chile, Germany, Indonesia, Iran, Japan, Kazakhstan, South Korea, Mexico, the Netherlands, New Zealand, Nigeria, the Philippines, Poland, Saudi Arabia, South Africa, Sweden, Switzerland, Turkey, the UAE
A country that does not implement the recommended measures or a country where information can not be obtained.	Austria, Egypt, Norway, Syria, North Korea

(3) Efforts to Maintain and Improve the Highest Level of Nuclear Security

A) Minimization of HEU and plutonium stockpile in civilian use

In June 2018, Norway co-hosted the third International Symposium on HEU Minimization with the IAEA. Norway encouraged all member states to sign up to the "Joint Statement on Minimising and Eliminating the Use of Highly Enriched Uranium in Civilian Applications (INFCIRC/912)."[78] Thus, the minimization of HEU in civilian use is gaining international attention in the context of today's nuclear security efforts.

Since HEU, in addition to fueling some research reactors, can also be used for the manufacture of nuclear explosive devices, it is regarded as "two sides of the same coin" for weapons and civilian use. Therefore, from the viewpoint of "attractiveness" to terrorists, it is difficult to deny the possibility that fissile materials will pose a nuclear security risk to the country holding such nuclear material. Historically, HEU has long been considered to pose a proliferation risk in terms of state-to-state technology transfers. More recently, the "9.11" terrorist attacks in the United States triggered new nuclear security concerns regarding the spread of fissile material to non-state actors, including international terrorists.[79] To address this particular concern, the United States in 2004 introduced the Global Threat Reduction Initiative (GTRI), to manage the return of Russian and U.S.-origin HEU located in civilian sites to its country of origin, and the conversion of research reactors to operate with low enriched uranium (LEU).

It can be said that GTRI raised the level of caution for the international community about the risk of "attractive" fissile material being stolen for terrorist use, and encouraged

[78] Statement by the Norwegian Delegation at the 62nd General Conference of the IAEA, September 2018, https://www.iaea.org/sites/default/files/18/09/gc62-norway-statement.pdf.

[79] "Past and Current Civilian HEU Reduction Efforts," Nuclear Threat Initiative website, December 20, 2017, http://www.nti.org/analysis/articles/past-and-current-civilian-heu-reduction-efforts/.

concrete counter measures. However, it was then U.S. President Barack Obama's "Prague speech" in April 2009[80] that was a major factor in raising world public awareness, including international media, about the importance of nuclear security. As a measure to pursue strengthening of nuclear security, the need to minimize HEU and plutonium became better understood in concerned countries. While HEU minimization for civilian use was included early in the joint communiqué of the Nuclear Security Summit, it took more time for consensus to be reached on minimizing plutonium stocks. Most of the HEU is for military use, less for civilian use, and its inventory has been steadily reduced. On the other hand, plutonium for civilian use accounts for the majority, and the stock volume is increasing.

Throughout the Nuclear Security Summit process, minimization of HEU in civilian use had been treated as one of the top priority issues. The 2014 Hague Nuclear Security Summit Communiqué stipulates keeping state stockpiles of separated plutonium to the minimum level consistent with national requirements.[81] According to the fact sheet published by the United States at the Washington Nuclear Security Summit in March 2016, HEU and plutonium have been removed or down-blended at 50 facilities in 30 countries.[82] In addition, as a result of Indonesia completing the withdrawal of domestic HEU in 2017,[83] Southeast Asia, following South America and Central Europe, has become a region where there is no nuclear material attractive for terrorists. In the list of major achievements of the GTRI efforts announced by the U.S. Department of Energy in 2018, conversion of the HEU research reactor in Nigeria and an isotope production facility in the Netherlands; establishment of the first non-HEU Molybdenum-99 (Mo-99) production in the United States in nearly 30 years; removal of over 325 kg of HEU from multiple countries; and down blending of a cumulative of 160 MT of surplus HEU are enumerated.[84] In connection with these efforts, the IAEA has helped remove 27 disused highly radioactive sources from five South American countries in a significant step forward for nuclear safety and security in the region. It was the largest such project ever facilitated by the IAEA until 2018. The material, mainly used for medical purposes such as treating cancer and sterilizing instruments, was transported to Germany and the United States for recycling. Canada, where some of the sources were manufactured, funded the project upon requests for IAEA support from Bolivia,

[80] Remarks by President Barack Obama in Prague as Delivered, The White House Office of the Press Secretary, April 5, 2009, https://www.whitehouse.gov/the-press-office/remarks-president-barack-obama-prague-delivered.

[81] "Hague Communiqué," 2014 Hague Nuclear Security Summit, March 25, 2014.

[82] The White House Office of the Press Secretary, "Fact Sheet: The Nuclear Security Summits: Securing the World from Nuclear Terrorism," March 29, 2016, https://obamawhitehouse.archives.gov/the-press-office/2016/03/29/fact-sheet-nuclear-security-summits-securing-world-nuclear-terrorism.

[83] NTI, "Civilian HEU Dynamic Map," Nuclear Threat Initiative website, December 2017, http://www.nti.org/gmap/other_maps/heu/index.html.

[84] U.S. Department of Energy National Nuclear Security Administration, "Prevent, Counter, and Respond-A Strategic Plan to Reduce Global Nuclear Threats FY2019-FY2023 Report to Congress," October 2018, https://www.energy.gov/sites/prod/files/2018/10/f57/FY2019%20NPCR.pdf.

Ecuador, Paraguay, Peru and Uruguay.[85]

Although this is an issue beyond the category of civilian use of HEU and plutonium, there has been a debate in recent years about whether nuclear materials used for military purposes should be subject to similar standards of accountability.[86] Even in 2018, at the 62nd IAEA General Conference, Switzerland issued a statement to encourage comprehensive nuclear security for all nuclear material in both civilian use and non-civilian use.[87]

In the above regard, at the 62nd IAEA General Conference and on other occasions, the following updates on commitments to minimize HEU and plutonium use were made:

- China completed its support for conversion of Ghana's Miniature Neutron Source Reactor (MNSR) to a LEU fuel system in 2017. This success is called "Ghana model" in China.[88]
- Nigeria announced that research reactor fuel is being converted to LEU-type fuel with support from the IAEA, the U.S., China, the U.K. and Norway.[89]
- Netherlands completed the conversion from HEU to LEU fuel for the production of medical isotopes in 2018.[90]
- In 2018, the Japan Atomic Energy Commission revised the "The Basic Principles on Japan's Utilization of Plutonium" for the first time in 15 years, upholding the principle of not possessing plutonium that does not have a specific purpose under the Atomic Energy Basic Act, and launched measures to reduce the size of its plutonium stockpile.[91] It also mentioned the following about plutonium used for research and development. "Examine all options such as use and disposal of plutonium that is associated with research and development purposes, if there is no concrete plan for its immediate use, while ensuring flexibility depending on the situations."[92] In this regard, Japan

[85] "IAEA Helps Remove Highly Radioactive Material from Five South American Countries," IAEA website, April 30, 2018, https://www.iaea.org/newscenter/pressreleases/iaea-helps-remove-highly-radioactive-material-from-five-south-american-countries.

[86] *Hiroshima Report 2017*, pp.109-110; *Hiroshima Report 2018*, pp. 111-112.

[87] Statement by Mr Benoît Revaz, State Secretary and Director of the Swiss Federal Office of Energy at the 62nd Session of the IAEA General Conference, September 2018, https://www.iaea.org/sites/default/files/18/09/gc62-switzerland-statement_en.pdf.

[88] Statement by the Chinese Delegation, 62nd General Conference of the IAEA, September 2018, https://www.iaea.org/sites/default/files/18/09/gc62-china-statement.pdf.

[89] Nigeria's Country Statement Delivered by his Excellency Mr. Ibrahim Usman Jibril, Honourable Minister of State for Environment at the 62nd General Conference of the IAEA, September 2018, https://www.iaea.org/sites/default/files/18/09/gc62-nigeria-statement.pdf.

[90] Statement by Ms. Anke ter Hoeve-van Heek, Deputy Permanent Representative of the Kingdom of the Netherlands to the IAEA, September 19, 2018, https://www.iaea.org/sites/default/files/18/09/gc62-netherlands-final-statement.pdf.

[91] Japan Atomic Energy Commission, "The Basic Principles on Japan's Utilization of Plutonium," July 31, 2018, http://www.aec.go.jp/jicst/NC/iinkai/teirei/3-3set.pdf.

[92] Ibid.

has stated that it will steadily carry out plutonium thermal power generation, increase transparency in the use and management of its plutonium, and accept stringent IAEA safeguards.[93]

B) Prevention of illicit trafficking

Nuclear detection, nuclear forensics, research and development of new technologies to strengthen enforcement capacity of law enforcement machinery and customs department, participation for the IAEA's Incident and Trafficking Database (ITDB) have been regarded as important measures for preventing illicit trafficking of nuclear materials. In particular, the IAEA ITDB is the database on incidents related to unauthorized possession, illicit trafficking, illegal dispersal of radioactive material, and discovery of nuclear and other radioactive material out of regulatory control. The ITDB has been regarded not only as an essential component of the information platform supporting the IAEA's Nuclear Security Plan, but also in terms of statistics, which bring to light the real existence of a nuclear security threat.[94]

As of December 31, 2017, 136 states participate in the ITDB program.[95] According to the latest IAEA Annual Report 2017, states confirmed 166 incidents during 2017.[96] Considering that the number of reports to ITDB was 189 in 2016,[97] the number of cases decreased by 23 in 2017.

On the other hand, the IAEA Nuclear Security Report[98] specifies the following details. During the reporting period, states reported, or otherwise confirmed to the ITDB program, a total of 127 incidents. In this regard, 235 occurred between July 1, 2017 and June 30, 2018, and the remaining cases had occurred prior to July 1, 2017 but were not reported by that date. Of the 235 newly reported incidents, three were related to trafficking and four were a scam. All of the material involved in these incidents was seized by the relevant competent authorities within the reporting State. No incident involved highly enriched uranium, plutonium or Category I sources. On the other hand, there were 33 reported incidents in which the intent to conduct trafficking or malicious use could not be determined. These included 17 thefts, four unauthorised possessions and 12 incidents of missing materials. In 25 incidents the materials were not recovered, including one

[93] Statement by Minister of State Masaji Matsuyama at the 62nd General Conference of the IAEA, September 17, 2018, https://www.iaea.org/sites/default/files/18/09/gc62-japan-statement.pdf.

[94] IAEA, "ITDB: Incident and Trafficking Database," https://www.iaea.org/sites/default/files/16/12/16-3042_ns_to_itdb_web-20160105.pdf.

[95] IAEA, "IAEA Incident and Trafficking Database (ITDB) Incidents of Nuclear and Other Radioactive Material Out of Regulatory Control," IAEA website, https://www.iaea.org/sites/default/files/18/12/itdb-factsheet-2018.pdf.

[96] IAEA Annual Report 2017, GC(62)/3, https://www.iaea.org/sites/default/files/publications/reports/2017/gc62-3.pdf, p. 85.

[97] IAEA Annual Report 2015, GC(60)/9, https://www.iaea.org/About/Policy/GC/GC60/GC60Documents/English/gc60-9_en.pdf, pp. 90-91.

[98] IAEA, Nuclear Security Report 2018, GOV/2018/36-GC(62)/10, August 6, 2018, https://www-legacy.iaea.org/About/Policy/GC/GC62/GC62Documents/English/gc62-10_en.pdf, pp. 2-3.

incident relating to Category III radioactive sources. In addition to this, there were also 125 reported incidents in which the material was out of regulatory control, but not related to trafficking, malicious use or scams. Most of these incidents involved unauthorized disposal, unauthorized shipments and unexpected discoveries of material such as previously lost radioactive sources.

As of December 31, 2017, the ITDB contained a total of 3,235 confirmed incidents reported by participating states since 1993. Of these 3,235 confirmed incidents there are 278 incidents that involved a confirmed or likely act of trafficking or malicious use (Group I), 913 incidents for which there is insufficient information to determine if it is related to trafficking or malicious use (Group II), and 2,044 incidents that are not related to trafficking or malicious use (Group III).[99]

In order to protect sensitive information, detailed information on incidents and illicit trafficking is not published.[100] Therefore, as it is not possible to assess the involvement of the surveyed countries, this report considers only their respective participation status.

Preventive measures against illicit trafficking of nuclear and other radiological material include the development of legal instruments for export control and enforced detection capability, such as the installation of sensing devices for radiological material at national borders and reinforcing nuclear forensic capabilities. The following describe some of efforts taken from 2017 to 2018 as preventive measures against illicit trafficking of nuclear and other radiological material:

- Austria held the "Second Technical Meeting on Radiation Detection Instruments for Nuclear Security: Trends, Challenges and Opportunities" by the IAEA in April.[101] In June, Austria also held a workshop on the evaluation of the technologies used for border surveillance, at the IAEA laboratory in Seibersdorf. The workshop focused on the evaluation tests of the spectroscopic handheld detectors to monitor radioactive material, and also supported the efforts of the Border Monitoring Working Group – a cooperation and coordination mechanism between the European Union, the United States and the IAEA – to detect illicit trafficking of nuclear and other radioactive material that is out of regulatory control.[102]

[99] IAEA, IAEA Incident and Trafficking Database (ITDB) Incidents of Nuclear and Other Radioactive Material out of Regulatory Control 2017 Fact Sheet, https://www.iaea.org/sites/default/files/17/12/itdb-factsheet-2017.pdf, p. 2.

[100] Ibid., p. 1.

[101] "Second Technical Meeting on Radiation Detection Instruments for Nuclear Security: Trends, Challenges and Opportunities," IAEA website, https://www.iaea.org/events/second-technical-meeting-on-radiation-detection-instruments-for-nuclear-security-trends-challenges-and-opportunities.

[102] Catherine Friedly, "Workshop Aids Nuclear Security Experts in Testing and Evaluating Technology Used for Border Monitoring," IAEA website, July 24, 2018, https://www.iaea.org/newscenter/news/workshop-aids-nuclear-security-experts-in-testing-and-evaluating-technology-used-for-border-monitoring.

- Nigeria announced that it is developing a National Nuclear Security Detection Architecture roadmap with the support of the IAEA, based on overall assessment of national security needs and capabilities, as well as economic and technical resources.[103]
- Kazakhstan announced that it is strengthening the system to combat the illegal trafficking of nuclear and other radioactive materials under full implementation of Security Council Resolution 1540.[104]
- The United States announced that it will sustain and build upon the roughly 57,000 radiation detectors operating at the U.S. seaports, border crossings and within the American interior, to thwart the smuggling of nuclear weapons and materials.[105]
- Indonesia's Nuclear Energy Regulatory Agency, Badan Pengawas Tenaga Nuklir (BAPETEN) requested the IAEA's assistance on nuclear security prior to the 18th Asian Games in Jakarta and Palembang, Indonesia, held from August to September 2018. In this case, Indonesia received training and advice to support the incorporation of nuclear security into the Games' overall security plan, and also provided handheld radiation detection equipment by the IAEA.[106]

In terms of international and regional organization efforts, INTERPOL provides a forum for collecting data on prevention of nuclear terrorism, supporting investigation, and confidence building and coordination among national law enforcement agencies. In 2018, INTERPOL conducted a "RADNUC" Cross-Border Radiological and Nuclear Investigations and Coordination Workshop in Tbilisi, Georgia in January, attended by some 40 experts from seven countries (Armenia, Azerbaijan, Bulgaria, Georgia, Moldova, Romania and Ukraine). The workshop brought together law enforcement representatives from police, customs, border control, intelligence units and civil defense, with the aim to identify, assess and address the gaps in a country's ability to coordinate investigations into the smuggling of radiological and nuclear material.[107]

Table 3-6 shows the implementation status regarding the minimization of HEU for peaceful purposes, participation status for the ITDB and measures for the prevention of illegal transfer

[103] Nigeria's Country Statement Delivered by his Excellency Mr. Ibrahim Usman Jibril, Honourable Minister of State for Environment at the 62nd General Conference of the IAEA, September 2018, https://www.iaea.org/sites/default/files/18/09/gc62-nigeria-statement.pdf.

[104] Statement by the Minister of Energy of Kazakhstan Kanat Bozumbaev at the 62nd Session of the IAEA General Conference, September 2018, https://www.iaea.org/sites/default/files/18/09/gc62-kazakhstan-statement.pdf.

[105] NPR 2018, p. 67.

[106] Catherine Friedly, "IAEA Helped Indonesia Implement Nuclear Security at the 2018 Asian Games," IAEA website, October 25, 2018, https://www.iaea.org/newscenter/news/iaea-helped-indonesia-implement-nuclear-security-at-the-2018-asian-games.

[107] "News and Events: RADNUC Investigation and Coordination Workshop in Tbilisi," INTERPOL website, https://www.interpol.int/Crime-areas/CBRNE/News-and-Events.

of nuclear material and other radiological materials, based on official statements made at the past Nuclear Security Summits, IAEA Nuclear Security Conferences, and any other opportunities.

C) Acceptance of international nuclear security review missions

The International Physical Protection Advisory Service (IPPAS) provides recommendations to improve the physical protection system of nuclear material, associated facilities, and transport systems of the state, upon the request of a member state. In IPPAS missions, an IPPAS team, consisting of physical protection experts organized by the IAEA, visits government organizations and nuclear facilities in a state, reviews the physical protection system of the facility in detail, and conducts hearing investigations, in order to assess whether or not the reviewed physical protection system is in line with the recommendations of the IAEA INFCIRC/225, and to provide advice where necessary for its improvement. As was pointed in an earlier issue of this report,[108] acceptance of the IAEA missions is a valuable opportunity for member states to have an authoritative third-party peer review of their national nuclear security systems. Of course, there are various nuclear security-related treaties and guidelines. However, since the details of concrete implementation will ultimately be left to the governments of each country, measures to strengthen nuclear security tend to be self-righteous in some cases. For this reason, the peer review process, which points out the items and methods to be improved mutually by external organizations, contributes to implementing nuclear security related measures. The external evaluation and recommendations obtained from the IPPAS mission are useful for reviewing the policy of future nuclear security enhancement in the host country. According to the nuclear security-related events list released by the IAEA in 2018, there were four events related to international evaluation missions.[109] Since the number of events in the previous year was 14, the number in 2018 decreased by ten.

In 2018, the IAEA announced the completion of the second IPPAS mission in Switzerland in May.[110] Also, an IPPAS follow-up mission was held in France in March and in Japan in November.[111] Outside the surveyed countries, the IPPAS mission in Ecuador was completed

[108] *Hiroshima Report 2017*, p.116.

[109] "Meetings, Conferences and Symposia: Meetings on Nuclear Safety and Security," IAEA website, http://www-ns.iaea.org/meetings/default.asp?tme=ns&yr=2017&s=10&l=79&submit.x=7&submit.y=7.

[110] Peer Review and Advisory Services Calendar, IAEA website, https://www.iaea.org/services/review-missions/calendar?type=3170&year%5Bvalue%5D%5Byear%5D=&location=All&status=All; Statement by Mr Benoît Revaz, State Secretary and Director of the Swiss Federal Office of Energy at the 62nd Session of the IAEA General Conference, September 2018, https://www.iaea.org/sites/default/files/18/09/gc62-switzerland-statement_en.pdf.

[111] "Peer Review and Advisory Services Calendar," IAEA website, https://www.iaea.org/services/review-missions/calendar?type=3170&year%5Bvalue%5D%5Byear%5D=&location=All&status=All; "IAEA Completes Nuclear Security Advisory Mission in Japan," IAEA website, December 7, 2018, https://www.iaea.org/newscenter/pressreleases/iaea-completes-nuclear-security-advisory-mission-in-japan.

Table 3-6: The implementation status of the minimization of HEU and Plutonium Stockpile for peaceful purposes and measures for the prevention of illegal transfer

	HEU and Plutonium stockpile minimization for peaceful purposes	Participation in the ITDB	Preventive measures against illegal transfer
China	○	○	○
France	○	○	○
Russia	○	○	○
U.K.	○	○	○
U.S.	○	○	○
India	○	○	○
Israel	○	○	○
Pakistan		○	○
Australia	○	○	○
Austria	○	○	○
Belgium	○	○	○
Brazil	○	○	○
Canada	○	○	○
Chile	○	○	○
Egypt			○
Germany	○	○	○
Indonesia	○	○	○
Iran		○	
Japan	○	○	○
Kazakhstan	○	○	○
South Korea	○	○	○
Mexico	○	○	○
Netherlands	○	○	○
New Zealand	○	○	○
Nigeria	○	○	○
Norway	○	○	○
Philippine	○	○	○
Poland	○	○	○
Saudi Arabia		○	
South Africa	○	○	○
Sweden	○	○	○
Switzerland	○	○	○
Syria	○		
Turkey	○	○	○
UAE		○	○
North Korea			

"○" is provided to the countries for which public information on the effort in these areas is obtained.

in March.[112] According to the IAEA, IPPAS missions are scheduled to be held in Lebanon in February, Belgium in June, Madagascar in August and Uruguay in November, respectively in 2019.[113]

Apart from the IPPAS missions, the IAEA also provides the International Nuclear Security Advisory Service (INSServ) and the Integrated Nuclear Security Support Plan (INSSP), for the sake of developing nuclear security systems and capabilities. In accordance with the IAEA, the INSServ provides recommendations to improve a broad spectrum of nuclear security activities of the state, by reviewing its nuclear security system and requirements.[114] Also, INSSP provides a platform for nuclear security work to be implemented over a period of time, thus ensuring sustainability. INSSP review missions enable the IAEA, the state concerned, and any donors financing the work, to plan and coordinate activities from both a technical and a financial point of view—optimizing the use of resources and avoiding duplications.[115]

Regarding advisory services by IAEA other than IPPAS, the Philippines accepted the review of INSSP in April 2018 and it was stated that this advice was reflected in the Philippines' Nuclear Security Support Center in July.[116] South Africa also announced that the updates of the INSSP plans are advancing under the support of the IAEA.[117]

D) Technology development —nuclear forensics

Since its importance was pointed out in the Ministerial Declaration of 2016,[118] nuclear forensics has become the key nuclear security technology. Through provision of nuclear forensic relevant guidance and training, organizations such as the IAEA have supported the development of technology and systems for seamless management of crime using nuclear and radioactive materials from the site where the target material was seized to the analytical laboratory.[119] In fact, since the first Washington Nuclear Security Summit in 2010, it has been recommended at each summit to build nuclear

[112] "Peer Review and Advisory Services Calendar," IAEA website, https://www.iaea.org/services/review-missions/calendar?type=3170&year%5Bvalue%5D%5Byear%5D=&location=All&status=All.

[113] Ibid.

[114] International Nuclear Security Advisory Service (INSServ), IAEA website, https://www.iaea.org/services/review-missions/international-nuclear-security-advisory-service-insserv.

[115] Integrated Nuclear Security Support Plan (INSSP), IAEA website, http://www-ns.iaea.org/security/inssp.asp?s=4.

[116] Statement of the Philippines by H.E. Ambassador Maria Cleofe R. Natividad at the 62nd Regular Session of the IAEA General Conference, September 2018, https://www.iaea.org/sites/default/files/18/09/gc62-philippines-statement.pdf.

[117] Statement by the Republic of South Africa Delivered by Deputy Minister of Energy, Ambassador Thembisile Majola, MP on the Occasion of the 62nd Session of the IAEA General Conference, September 2018, https://www.iaea.org/sites/default/files/18/09/gc62-south_africa-statement.pdf.

[118] GC(61)/24: Nuclear Security Plan 2018-2021, September 14, 2017, https://www-legacy.iaea.org/About/Policy/GC/GC61/GC61Documents/English/gc61-24_en.pdf, p. 4.

[119] Ibid., p. 14.

forensics capability and multilateral cooperation for that purpose.[120] Above all, at the fourth Washington Nuclear Security Summit in 2016, 30 concerned states issued a Joint Statement on Forensics in Nuclear Security, reflecting the growing awareness of the international community about the importance of nuclear forensics.[121] In accordance with the "IAEA Nuclear Security Series No.2-G (Rev.1) Nuclear Forensics Support (2006)"[122] definition, nuclear forensics is the technological method for the investigation of nuclear and other radiological material that has been removed without authorization from regulatory control and seized by a law enforcement authority of state. Following the increased threat perception of nuclear terrorism, technological development of nuclear forensics has been required so as to complement existing efforts to strengthen nuclear security. In particular, analysis on intercepted illicit nuclear or radioactive material and any associated material, to provide evidence for nuclear attribution, is the subject matter of nuclear forensics. Therefore, nuclear forensic analysis includes the characterization of the material and correlation with its production history.[123]

As for a case of multilateral cooperation on nuclear forensics, the Nuclear Forensics International Technical Working Group (ITWG) was established in 1996 under the auspices of the G8 Non-Proliferation Expert Group (NPEG), for the purpose of addressing the issue of illegal transfers following the end of the Cold War. The ITWG serves as the platform to support the technological development and sharing of nuclear forensic methods. Over the past few years, it has pursued a number of activities. These include conducting comparative nuclear material exercises (CMX) that socialize nuclear forensic techniques and identify best practices. Also, ITWG conducted exercises that clarify the uses and utility of national nuclear forensic libraries in helping identify the origin of nuclear or other radioactive material found outside regulatory control.[124] The ITWG has been focusing on the promotion of nuclear forensic best practice through the development of guidelines for forensic analysis of nuclear, radioactive, and radiologically contaminated materials, and published "Guidelines for Evidence Collection in a Radiological or Nuclear Contaminated Crime Scene (2011)"[125] and "Proposed Framework for National Nuclear Forensics Libraries and

[120] The White House, Office of the Press Secretary, "Work Plan of the Washington Nuclear Security Summit," April 13, 2010.

[121] "Joint Statement on Forensics in Nuclear Security," 2016 Washington Nuclear Security Summit, April 5, 2016, http://www.nss2016.org/document-center-docs/2016/4/1/joint-statement-on-forensics-in-nuclear-security.

[122] IAEA Nuclear Security Series No.2-G (Rev.1), "Nuclear Forensics Support," 2006, http://www-pub.iaea.org/books/IAEABooks/10797/Nuclear-Forensics-in-Support-of-Investigations.

[123] Ibid., p. 3.

[124] "EU-US Nuclear Forensics International Technical Working Group (ITWG) Joint Statement," 2016 Washington Nuclear Security Summit, April 1, 2016, http://www.nss2016.org/document-center-docs/2016/4/1/eu-us-nuclear-forensics-international-technical-working-group-itwg-joint-statement.

[125] ITWG "Guideline," ITWG website, http://www.nf-itwg.org/sites/default/files/pdfs/ITWG_Guideline_for_RN_Evidence_Collection_FINAL.pdf.

International Directories (2011)."[126] Indeed, many ITWG-related meetings were held in 2018 as well.[127] In June, the ITWG Annual Meeting (ITWG-23) was held in Switzerland and the GICNT Implementation and Assessment Group Meeting was held in Finland. In addition, the second KINAC-SIPRI Nuclear Non-Proliferation and Security Seminar: State Implementation of the National Nuclear Forensic Libraries was held in Sweden in cooperation of the Stockholm International Peace Research Institute (SIPRI) and the Korea Institute of Nuclear Nonproliferation and Control (KINAC). In September, the Australia-New Zealand Forensics Science without Borders Conference, IAEA Regional Training Course on Introduction to Nuclear Forensics (Spanish Speaking), and ITWG sixth Collaborative Materials Exercise (CMX-6) were held respectively. In October and November, the IAEA International Training Course on Practical Introduction to Nuclear Forensics was held in Hungary, as well as the IAEA Regional Training Course on Introduction to Nuclear Forensics (French Speaking), held in Senegal.

Another international cooperation initiative, the Nuclear Forensic Working Group (NFWG), chaired by Canada[128] and established under the framework of the GICNT, actively organized a number of workshops and tabletop exercises.[129] In February 2018, the nuclear forensics exercise "Destiny Elephant" was held in the United Kingdom "Destiny Elephant" built on the outcomes of the 2014 Exercise "Mystic Deer" by applying the GICNT best practices guidance document "Forensics Fundamentals for Policymakers" to current nuclear forensics challenges.[130]

As a remarkable new initiative, in March 2018, the IAEA launched a new coordinated research project in which nuclear forensic scientists from different States with various capabilities will work together to improve the implementation of nuclear forensics in the context of national laws, and to support investigative needs.[131] To support Member States in strengthening their nuclear forensic science capacity, the IAEA, in collaboration with the Hungarian National Nuclear Forensic Laboratory, held a practical training course in October 2018 in Hungary.[132]

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[126] "Nuclear Forensics Libraries," ITWG website, http://www.nf-itwg.org/sites/default/files/pdfs/National_Nuclear_Forensic_Libraries_TOR_FINAL.pdf.

[127] GC(61)/24: Nuclear Security Plan 2018-2021, September 14, 2017, http://www.nf-itwg.org/newsletters/ITWG_Update_no_7.pdf.

[128] "Fact Sheet," GICNT website, June 2018, http://www.gicnt.org/documents/GICNT_Fact_Sheet_June2018.pdf.

[129] "Key Multilateral Events and Exercises," GICNT website, http://www.gicnt.org/documents/GICNT_Past_Multilateral_Events_July2018.pdf.

[130] Ibid., p. 16.

[131] David Kenneth Smith and Timofey Tsvetkov, "NEW CRP: Applying Nuclear Forensic Science to Respond to a Nuclear Security Event (J02013)," IAEA website, May 7, 2018, https://www.iaea.org/newscenter/news/new-crp-applying-nuclear-forensic-science-to-respond-to-a-nuclear-security-event-j02013.

[132] Inna Pletukhina, "Crime Scene to Court Room: Implementing Nuclear Forensic Science," IAEA website, October 29, 2018, https://www.iaea.org/newscenter/news/crime-scene-to-court-room-implementing-nuclear-forensic-science.

Nuclear forensics related information has been generally limited, and details have not been released to the public. Therefore, the list of countries and organizations participating in recent exercises related to nuclear forensics (ITWG-CMX) is shown in the following table (Table 3-7).[133] Although this list is merely information on participation, it is considered to be a reference for the nuclear forensics ability of each country.

E) Capacity building and support activities

Around the time when the Nuclear Security Summit process started, in many states and regions, capacity in nuclear security also began to be built up and international cooperation efforts for nuclear security were actively promoted. As an example of such efforts leading up to the present capacity building, in 2018, Canada announced that it has finalized an additional $9.65 million contribution to the Nuclear Security Fund (NSF), in order to enhance nuclear security through the sustainable management of disused sealed radioactive sources in countries in Latin America, Africa and the Pacific.[134] Sweden has reported technical cooperation in the field of nuclear safety and nuclear security for many years with Belarus, Georgia, Moldova, Russia and Ukraine.[135] Norway has undertaken a partnership to assist Romania in strengthening its regulatory infrastructure for nuclear safety and security based on cooperation with the IAEA since 2009. In September 2018, it was announced that the partnership between the two countries will be extended for another four years. The partnership agreed to advance the improvement of Romania's capabilities to prevent accidents and malicious acts involving nuclear or other radiological material. It also aims to strengthen the country's preparedness for nuclear and radiological incidents and emergencies.[136]

Various approaches to the above-mentioned capacity building included developing teaching and training in nuclear security, for example, by setting up training courses in that field, and establishing Centers of Excellence (COE) for experts from these states and regions to improve their capacity in nuclear security. In the above regard, at the 62nd IAEA General Conference and on other occasions, the following updates on the development and utilization of the COEs

[133] Jon M. Schwantes, et al., "State of practice and emerging application of analytical techniques of nuclear forensic analysis: highlights from the 4th Collaborative Materials Exercise of the Nuclear Forensics International Technical Working Group (ITWG)" J Radioanal Nucl Chem, DOI 10.1007/s10967-016-5037-5 (published online, September 16, 2016).

[134] Canadian Statement by Ambassador Heidi Hulan, Permanent Representative of Canada to the International Organizations in Vienna at the 62nd General Conference of the IAEA, September 2018, https://www.iaea.org/sites/default/files/18/09/gc62-canada-statement-en.pdf.

[135] Sweden Statement by H.E. Ambassador Mikaela Kumlin Granit at the 62nd General Conference of the IAEA, September 2018, https://www.iaea.org/sites/default/files/18/09/gc62-sweden-statement.pdf.

[136] Miguel Santini, "Norway and Romania Extend IAEA-supported Partnership to Strengthen Nuclear and Radiological Safety and Security," IAEA website, October 2, 2018, https://www.iaea.org/newscenter/news/norway-and-romania-extend-iaea-supported-partnership-to-strengthen-nuclear-and-radiological-safety-and-security.

Table 3-7: Participating countries / institution list of the CMX organized by the ITWG

	Country / Region	Name of institution
Europe	European Union	Institute for Trans-Uranium Elements
	U.K.	AWE Aldermaston
	Germany	Institut fur Radiochemie
	France	CEA Valduc
	Austria	Austrian Research Center
	Sweden	Swedish Defence Research Agency
	Hangary	Institute of Isotope and Surface Chemistry
	Poland	Institure of Nuclear Chemistry and Technology
	Czech	Nuclear Research Institute
	Lithuania	Lithuanian Institute of Physics
	Moldova	Laboratory of Radiology and Radiation Control
	Russia	Laboratory of Microparticle Analysis
North and South America	U.S.	Lawrence Livermore National Laboratory
	Canada	Defence R&D Canada
	Brazil	Comissao Nacional de Energia Nuclear
Asia / Oceania	Japan	Japan Atomic Energy Agency
	South Korea	Korea Atomic Energy Research Institute
	Singapore	Defence Science Organisation
	Turkey	Cekmece Nuclear Research and Training Center
	Australia	Australian Nuclear Science and Technology Organisation
Africa	South Africa	South African Nuclear Energy Corporation

were made:

- China has managed nearly 100 training courses at the COE that was launched in 2016 and implemented capacity building support. Approximately 2,000 experts participated in these training courses from home and abroad.[137]
- India announced that it has implemented international programmes on a variety of subjects at the Global Center for Nuclear Energy Partnership (GCNEP), established in 2010, including the areas of nuclear safety, security and safeguards, physical protection of nuclear facilities, emergency response to radioactive disperse devices, etc.[138]
- Pakistan operates the Pakistan Center of Excellence for Nuclear Security (PCENS), the National Institute for Nuclear Safety and Security (NISAS) and the Pakistan Institute of Engineering and Applied Sciences (PIEAS) under close cooperation with the IAEA. Pakistan announced that these institutions are conducting training for national and international participants in the fields of nuclear safety, security, material accounting, cyber security and human reliability programmes.[139]
- Indonesia announced that it will continue development and strengthening of its nuclear security infrastructure through the establishment of a Center of Excellence on Nuclear Security and Emergency Preparedness (I-CoNSEP), the Center for Security Culture and Assessment, graduate programmes in nuclear security, and the Regional School on Nuclear Security for Asia and the Pacific.[140]
- Japan has undertaken initiatives to contribute to the progress of nuclear security on a global scale through human resource development plan under the close cooperation of the IAEA and the Integrated Support Center for Nuclear Nonproliferation and Nuclear Security (ISCN) of Japan Atomic Energy Agency (JAEA).[141] Since its inauguration, JAEA-ISCN has held 144 training courses and workshops by March 2018 and has conducted training for 3,800 people from 75 countries and three international organizations. In addition, JAEA-ISCN promoted collaboration such as

[137] Statement by the Chinese Delegation, 62nd General Conference of the IAEA, September 2018, https://www.iaea.org/sites/default/files/18/09/gc62-china-statement.pdf.

[138] Statement by Dr. Sekhar Basu Chairman, Atomic Energy Commission and Secreatary, Department of Atomic Energy at the 62nd General Conference of the IAEA, September 19, 2018, https://www.iaea.org/sites/default/files/18/09/gc62-india-statement.pdf.

[139] Statement by the Leader of the Pakistan Delegation, 62nd General Conference of the IAEA, September 2018, https://www.iaea.org/sites/default/files/18/09/gc62-pakistan-statement.pdf.

[140] Statement by Dr. Darmansjah Djumala, Ambassador Extraordinary and Plenipotentiary/Permanent Representative of the Republic of Indonesia at the 62nd General Conference of the IAEA, September 2018, https://www.iaea.org/sites/default/files/18/09/gc62-indonesia-statement.pdf.

[141] Statement by Minister of State Masaji Matsuyama at the 62nd General Conference of the IAEA, September 17, 2018, https://www.iaea.org/sites/default/files/18/09/gc62-japan-statement.pdf.

information sharing, mutual visits of training facilities and co-organizing regional training courses with respective COEs in China, South Korea and other Asian countries.

Other countries' efforts on capacity building in 2018 are as follows. The International Center for Theoretical Physics (ICTP) held an International School on Nuclear Security in conjunction with the IAEA at the ICTP laboratory in Trieste.[142] The IAEA and the Spanish Nuclear Safety Council jointly organized the IAEA's International Schools on Nuclear Security for professionals from Spanish-speaking countries in Valdemoro, Spain in May. The course, which targeted early career professionals, consisted of both lectures and practical exercises covering a range of nuclear security topics, including transport security for nuclear and other radioactive material, and threat and risk assessment.[143] In June, the IAEA and the Ministry of Health in Barbados jointly organized the regional workshop for Central America and the Caribbean countries. During the workshop, more than 20 nuclear security professionals from 12 countries and regional organizations reviewed the basic elements of a national nuclear security regime and learned how the IAEA assists in strengthening nuclear and radiological security.[144]

Such efforts to set up COEs and implement training as described above not only help capacity building related to global nuclear security, but also contribute to promoting understanding of nuclear security among regional experts, operators and related organizations. Moreover, strengthening cooperation with each country's COE has advantages such as mutual exchange of instructors among COEs. At the same time, to promote efficient cooperation and closer information sharing, it is important to avoid duplication in the activities of the COEs that have been established during the past several years. These tasks include building a broad network around the IAEA and strengthening education and training through international support.

To maintain and further facilitate exchange of experts, information and training material, the International Network for Nuclear Security Training and Support Centres (NSSC Network) was established in 2012 under the leadership of the IAEA. In March 2018, the NSSC Network annual meeting was held in Tokai, Japan. In discussions at the meeting, the 77 participants from 52 States and two observer organizations encouraged an expansion of the Network's activities to include a programme of technical exchange visits during which national staff

[142] "Joint ICTP-IAEA International School on Nuclear Security," IAEA website, https://www.iaea.org/events/joint-ictp-iaea-international-school-on-nuclear-security.

[143] Matt Fisher, "Nuclear Security Skills Strengthened at IAEA Course in Spain," IAEA website, June 19, 2018, https://www.iaea.org/newscenter/news/nuclear-security-skills-strengthened-at-iaea-course-in-spain.

[144] Brunelle Battistella, "IAEA Regional Workshop Helps Raise Awareness of Nuclear Security in Central America and the Caribbean," IAEA website, July 18, 2018, https://www.iaea.org/newscenter/news/iaea-regional-workshop-helps-raise-awareness-of-nuclear-security-in-central-america-and-the-caribbean.

from existing and prospective Centres could learn from each other.[145] In addition, as an approach of the same kind, there is the activity of the International Nuclear Security Education Network (INSEN) by IAEA, to further advance technology development and information sharing related to nuclear security education. According to the IAEA's latest Nuclear Security Report, the Network now has 170 institutions from 62 Member States.[146]

F) IAEA Nuclear Security Plan and Nuclear Security Fund

The IAEA's fifth Nuclear Security Plan covering the period 2018-2021,[147] was approved in September 2017 and has been executed. For the sake of successful implementation of this plan, since 2002, when the IAEA established the Nuclear Security Fund (NSF) as a voluntary funding mechanism to prevent, detect, and respond to nuclear terrorism, the Agency has been calling on member states to make voluntary contributions to the Fund. According to the 2017 IAEA Annual Report (the latest at the time of writing this report), 16 countries and the European Commission pledged financial contributions to the NSF. Actual NSF revenue for FY 2017 was €44.1 million.[148] It is a decrease of €3.3 million compared with the previous year.

Two of the surveyed countries made statements at the 62nd IAEA General Conference regarding their commitments to the NSF. The United Kingdom said it made a contribution of £4.1 million to the NSF.[149] Germany revealed that its contributions to the NSF since 2011 have exceeded €5 million.[150]

G) Participation in international efforts

The international efforts to improve the level of nuclear security that this report draws attention to are not limited to the IAEA's International Conference on Nuclear Security, the NSS process that ended in 2016, UN Security Council Resolution 1540[151] and various contributions

[145] Susanna Lööf, "IAEA Network Fosters International Cooperation That Strengthens Nuclear Security, Members Agree at Annual Meeting," IAEA website, April 10, 2018, https://www.iaea.org/newscenter/news/iaea-network-fosters-international-cooperation-that-strengthens-nuclear-security-members-agree-at-annual-meeting.

[146] GOV/2018/36-GC(62)/10: Nuclear Security Repot 2018, https://www-legacy.iaea.org/About/Policy/GC/GC62/GC62Documents/English/gc62-10_en.pdf, p. 17.

[147] Nuclear Security Plan 2018-2021, GC(61)/24, September 14, 2017, https://www.iaea.org/About/Policy/GC/GC61/GC61Documents/English/gc61-24_en.pdf.

[148] IAEA, "IAEA Annual Report 2017," https://www.iaea.org/sites/default/files/publications/reports/2017/gc62-3.pdf, p. 85.

[149] UK National Statement at the 62nd General Conference of the IAEA, September 2018, https://www.iaea.org/sites/default/files/18/09/gc62-uk-_statement.pdf.

[150] Statement by Thorsten Herdan, Director General Federal Ministry for Economic Affairs and Energy at the 62nd General Conference of the IAEA, September 18, 2018, https://www.iaea.org/sites/default/files/18/09/gc62-germany-statement.pdf.

[151] Joint Statement on Promoting Full and Universal Implementation of UNSCR 1540 (2004), 2016 Washington Nuclear Security Summit, April 5, 2016, http://www.nss2016.org/document-center-docs/2016/4/1/joint-statement-on-1540-committee.

made by the INTERPOL. In the present circumstances, various other multilateral frameworks relevant to nuclear security are operating around the world. The establishment of a "Global Partnership against the Spread of Weapons and Materials of Mass Destruction" (G8GP) was agreed at the G8 Kananaskis Summit in 2002. It committed the G8 to raising up to $20 billion over the next ten years to fund nonproliferation projects, principally in Russia but also in other nations. The so-called "10 plus 10 over 10" initiative called for the United States to contribute $10 billion, and the other original G7 nations (Canada, France, Germany, Italy, Japan, the United Kingdom and the United States) a combined $10 billion to help the projects.[152]

In addition to the G8 member states (G7+ Russia), other donor participants (Australia, South Korea, Sweden, Switzerland, etc.) have participated in the G8GP and carried out various projects, in particular denuclearization cooperation in Russia. This work also includes destruction of chemical weapons, secure dismantling and transport of decommissioned nuclear-powered submarines, improved detection of nuclear and radiological materials, re-employment of former WMD scientists and technicians to civilian programs, and the removal and safe transportation of nuclear material in Kazakhstan. In relation to nuclear security, the Nuclear Safety and Security Group (NSSG) was established under the G8GP and has been working with nuclear security summits and the IAEA's international conferences on nuclear security. However, in response to Russia's annexation of Crimea in March 2014, the leaders of the G7 collectively decided to expel Russia from the G8 as a punitive measure.[153] As a result, the former G8 initiative has officially changed the name to "G7 Global Partnership Against the Spread of Weapons and Materials of Mass Destruction" (G7GP).[154]

Under the G7GP, Nuclear & Radiological Security Working Group (NRSWG) partners expressed support for the Information Sharing Initiative on Nuclear and Radiological Security projects in Ukraine, as outlined in the Cooperative Framework agreed in October 2018. In addition, for the purpose of enhancing global nuclear and radiological security, the NRSWG has set several items for its thematic areas as follows: physical protection measures at facilities housing nuclear and other radioactive material, radiological source security (whole-of-life management), prevention of illicit trafficking as well as detection and response to material outside regulatory control, nuclear security culture including training and nuclear security training and support centres, international legal frameworks related to nuclear security, nuclear forensics, information and computer security,

[152] NTI, "Global Partnership Against the Spread of Weapons and Materials of Mass Destruction ("10 Plus 10 Over 10 Program")," June 20, 2017, http://www.nti.org/learn/treaties-and-regimes/global-partnership-against-spread-weapons-and-materials-mass-destruction-10-plus-10-over-10-program/.

[153] Ibid.

[154] "G7 Global Partnership Against the Spread of Weapons and Materials of Mass Destruction," G7 2017 Italia website, http://www.g7italy.it/it/node/190.

transportation security, disposition and conversion of nuclear materials.[155] Regarding nuclear security, the G7 Statement on Non-Proliferation and Disarmament of the G7 foreign ministers' communique in 2018[156] states in para 27: "We are committed to facilitating efforts by states to use nuclear materials or embark on nuclear power programs for civilian purposes in accordance with the highest standards of nuclear safety, security and non-proliferation, and we encourage these states to develop a nuclear governance culture that takes into account interfaces between nuclear safety, security and safeguards, as well as cyber threats." Para 28 states: "We remain vigilant in ensuring that terrorists and other malicious actors do not obtain materials for committing acts of nuclear or radiological terrorism. In that context, we support the efforts of the Nuclear Security Contact Group to help ensure that we continue to implement our shared commitments to enhancing nuclear security worldwide. We also commend the work of the Global Initiative to Combat Nuclear Terrorism (GICNT). By convening a broad array of technical experts and policy makers from its 88 partner states and five official observer organizations, GICNT continues to provide a critical forum to address the shared global threat of nuclear terrorism." (The Nuclear Security Contact Group mentioned here refers to a group of concerned countries that has substantially inherited the Sherpa meeting, which played an important role in agenda setting and others at the nuclear security summit.[157]) In addition, the declaration states in para 29: "We encourage universalization and implementation of the International Convention for the Suppression of Acts of Nuclear Terrorism and of the Convention on the Physical Protection of Nuclear Material as amended in 2005, and call on states that have not yet done so to become parties to these key nuclear security instruments. We encourage the states that have not done so to become contracting parties to the Convention on Nuclear Safety and the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, and work toward their effective and sustainable implementation." Besides, the declaration concretely states that "Iran is the only state with an operational nuclear power plant that is not party to any of these conventions, and we call on it to adhere to them."

On the other hand, GICNT, which was agreed by the U.S.-Russia initiative at the St. Petersburg Summit in 2006, is another important international effort in the field of nuclear security. GICNT is a framework of voluntary international cooperation by concerned states. As mentioned in the previous section on nuclear forensics technology development, the presence of multilateral activities by GICNT for strengthening nuclear security has greatly increased in recent years. The GICNT

[155] "Nuclear & Radiological Security," GPWMD website, https://www.gpwmd.com/nrswg.

[156] "2018 G7 Statement on Non-Proliferation and Disarmament," G7 website, https://g7.gc.ca/en/g7-presidency/themes/building-peaceful-secure-world/g7-ministerial-meeting/g7-foreign-ministers-joint-communique/2018-g7-statement-non-proliferation-disarmament/.

[157] "Joint Statement on Sustaining Action to Strengthen Global Nuclear Security Architecture," Nuclear Security Contact Group website, April 5, 2016, http://www.nscontactgroup.org/.

now includes participation from 88 partner countries (including Australia, China, France, Germany, India, Israel, Japan, South Korea, Pakistan, Russia, Sweden, Switzerland, the United Kingdom and the United States) and six international organizations, including UN Office of Counter-Terrorism (UNOCT), newly joined in 2018 as official observers.[158] All partner nations have voluntarily committed to implementing the GICNT Statement of Principles (SOP), a set of broad nuclear security goals encompassing a range of deterrence, prevention, detection, and response objectives.[159] The eight principles contained within the SOP aim to improve accounting, control, and protection of nuclear/radiological material, enhance security of civilian nuclear facilities, detect and suppress illicit trafficking of nuclear/radiological material, assure denial of safe haven and resources from terrorists seeking to acquire or use nuclear/radiological material, and so on. Since 2010, the Implementation and Assessment Group (IAG, chaired by Finland) was established as a working arm of the GICNT partnership. IAG has several priority functional areas with working groups, such as the Nuclear Detection Working Group (NDWG, chaired by the United Kingdom), the Nuclear Forensic Working Group (NFWG, chaired by Canada) and Response and the Mitigation Working Group (RMWG, chaired by Argentina).[160]

Individual efforts concerning GICNT are as follows. In April, Hungary hosted the "Fierce Falcon" workshop to discuss how to respond to an attempted or actual theft of radiological material.[161] In May, Mexico hosted the "Black Jaguar" field exercise to strengthen prosecution measures for nuclear or radiological terrorist attacks. Issues of emergency response mitigation, radiological crime scene management, nuclear forensics, and communications protocols were addressed at the exercise.[162] In June, the Finnish Ministry of Foreign Affairs hosted a GICNT IAG meeting in Helsinki. The meeting was co-chaired by the United States and Russia, and a total of over 140 experts participated in the discussion on the progress of the three GICNT technical working groups.[163] In August, Malaysia organized the IAEA regional workshop in cooperation with the GICNT. The workshop used a table top exercise to help participants from three countries (Indonesia, Malaysia, and the Philippines) strengthen their capacity to

[158] "Global Initiative to Combat Nuclear Terrorism Partner Nations List," June 2018, http://www.gicnt.org/documents/GICNT_Partner_Nation_List_June2018.pdf.

[159] "Overview," GICNT Website, http://www.gicnt.org/index.html.

[160] "Global Initiative to Combat Nuclear Terrorism Fact Sheet," GICNT website, June 2018, http://www.gicnt.org/documents/GICNT_Fact_Sheet_June2018.pdf.

[161] Global Initiative to Combat Nuclear Terrorism (GICNT), NTI website, September 30, 2018, https://www.nti.org/learn/treaties-and-regimes/global-initiative-combat-nuclear-terrorism-gicnt/.

[162] Ibid.

[163] Michio Seya, "2-2 GICNT-IAG Kaigou Sanka Houkoku," *ISCN News Letter*, No.0257, August 2018, https://www.jaea.go.jp/04/iscn/nnp_news/attached/0257.pdf, pp. 16-23.

detect and respond to nuclear security events in coastal and maritime areas.[164]

In this report, it is expected that the acceptance of international nuclear security review missions such as IPPAS by the IAEA, national efforts regarding nuclear forensics, and commitments to nuclear security capacity-building and support will contribute to enhancing surveyed countries' nuclear security-related capabilities and performances, and make more effective their respective nuclear security systems. Furthermore, the contributions to the IAEA NSF, and participation in the G8GP (G7GP) and the GICNT, are indicators of the desire of states to enhance their commitment to nuclear security and can be used to undertake an overall evaluation of each country's nuclear security system. Table 3-8 below shows the participation status and efforts regarding these nuclear security initiatives.

[164] Catherine Friedly, "IAEA Holds Table Top Exercise to Strengthen Detection and Response Capabilities in Maritime Nuclear Security Events," IAEA website, October 3, 2018, https://www.iaea.org/newscenter/news/iaea-holds-table-top-exercise-to-strengthen-detection-and-response-capabilities-in-maritime-nuclear-security-events.

Table 3-8: The participation status in and effort for nuclear security initiatives

	IPPAS	Nuclear Forensics	Capacity Building & Support Activities	Nuclear Security Fund	G8 Global Partnership	GICNT
China	○	○	○	○	△	○
France	○	○	○	○	○	○
Russia		○	○	○	○	○
U.K.	○	○	○	○	○	○
U.S.	○	○	○	○	○	○
India			○	○	△	○
Israel		○		○		○
Pakistan		○	○	○		○
Australia	○	○	○	○	○	○
Austria			○	○	△	○
Belgium	○	○		○	○	○
Brazil			○		△	
Canada	○	○	○	○	○	○
Chile	○	○	○			○
Egypt	○		○			
Germany	○	○	○	○	○	○
Indonesia	○		○			
Iran	○			○		
Japan	○	○	○	○	○	○
Kazakhstan	○		○	○	○	○
South Korea	○	○	○	○	○	○
Mexico	○	○			○	○
Netherlands	○	○	○	○	○	○
New Zealand	○	○		○	○	○
Nigeria			○			○
Norway	○	○	○	○	○	○
Philippine	○		○		○	○
Poland	○				○	○
Saudi Arabia			○		△	○
South Africa	○	○	○		△	
Sweden	○	○	○	○	○	○
Switzerland	○	○	○	○	○	○
Syria						
Turkey	○	○		○	△	○
UAE	○		○	○	△	○
North Korea						

IPPAS: " ○ " is assigned for the countries that are planning to accept IPPAS or have held a related workshop.

G8 Global Partnership: " △ " is assigned for the countries that are considering of the participation in it.

Part II Evaluation

Country-by-Country Analysis

Evaluation Points and Criteria

In this "Evaluation" part, the performances of the 36 countries surveyed in this project on three areas, that is, nuclear disarmament, non-proliferation and nuclear security, are evaluated numerically, based upon study and analysis compiled in the "Report" section.

Evaluation of the four groups—nuclear-weapon states (NWS), non-parties to the Nuclear Non-Proliferation Treaty (NPT), non-nuclear-weapon states (NNWS), and one particular state (North Korea)—is made separately because of their different characteristics. Since different sets of criteria are applied to different groups of countries, full points differ according to the group each country belongs to. Then, as a measure to visualize a comparison of 36 countries' relative performances, each country's performances in each area is shown on a chart in percentage terms.

[Full Points for each group of countries]

Groups / Areas	(1) NWS	(2) Non-NPT Parties	(3) NNWS	(4) Other
	China France Russia the U.K. the U.S.	India Israel Pakistan	Australia, Austria, Belgium, Brazil, Canada, Chile, Egypt, Germany, Indonesia, Iran, Japan, Kazakhstan, South Korea, Mexico, the Netherlands, New Zealand, Nigeria, Norway, the Philippines, Poland, Saudi Arabia, South Africa, Sweden, Switzerland, Syria, Turkey, the UAE	North Korea*
Nuclear Disarmament	101	98	42	98
Nuclear Non-Proliferation	47	43	61	61
Nuclear Security	41	41	41	41

* North Korea declared its suspension from the NPT in 1993 and its withdrawal in 2003, and has conducted totally six nuclear tests in 2006, 2009, 2013, 2016 (twice) and 2017. However, there is no agreement among the states parties on North Korea's official status.

Following is point and scale of measurement of each evaluation criteria.

[Nuclear Disarmament]

Evaluation criteria	Maximum points	Scale of measurement
1. Status of Nuclear Forces (estimates)	**-20**	
Status of nuclear forces (estimates)	(-20)	-5 (～50); -6 (51～100); -8 (101～200); -10 (201～400); -12 (401～1,000); -14 (1,001～2,000); -16 (2,001～4,000); -17 (4,001～6,000); -19 (6,001～8,000); -20 (8,001～)
		(not applicable to the NNWS)
2. Commitment to Achieving a World without Nuclear Weapons	**11**	
A) Voting behavior on UNGA resolutions on nuclear disarmament proposals by Japan, NAC and NAM	(6)	On each resolution: 0 (against); 1 (abstention); 2 (in favor)
B) Announcement of significant policies and important activities	(3)	Add 1 point for each policy, proposal and other initiatives having a major impact on the global momentum toward a world without nuclear weapons (maximum 3 points).
C) Humanitarian consequences of nuclear weapons	(2)	On each resolution: 0 (against); 0.5 (abstention); 1 (in favor)
3. Treaty on the Prohibition of Nuclear Weapons (TPNW)	**10**	
A) Signing and ratifying the TPNW	(7)	0 (not signing); 3 (not ratifying); 7 (ratifying)
B) Voting behavior on UNGA resolutions on a legal prohibition of nuclear weapons	(3)	On each resolution: 0 (against); 0.5 (abstention); 1 (in favor)
4. Reduction of Nuclear Weapons	**22**	
A) Reduction of nuclear weapons	(15)	・Add 1～10 points in accordance with the decuple rate of reduction from the previous year for a country having declared the number of nuclear weapons. ・For a country having not declared it, add some points using the following formula: (the previous target – the latest target)÷the estimated number of nuclear weapons×10. ・Add 1 (engaging in nuclear weapons reduction over the past 5 years); add 1 (engaging in nuclear weapons reduction under legally-binding frameworks such as New Strategic Arms Reduction Treaty); add 1 (announcing further reduction plan and implementing it in 2018) ・Give a perfect score (15 points) in case of the total abolition of nuclear weapons.
		(not applicable to the NNWS)
B) A concrete plan for further reduction of nuclear weapons	(3)	0 (no announcement on a plan of nuclear weapons reduction); 1 (declaring a rough plan of nuclear weapons reduction); 2 (declaring a plan on the size of nuclear weapons reduction); 3 (declaring a concrete and detailed plan of reduction)
		(not applicable to the NNWS)

Evaluation criteria	Maximum points	Scale of measurement
C) Trends on strengthening/modernizing nuclear weapons capabilities	(4)	0 (modernizing/reinforcing nuclear forces in a backward move toward nuclear weapons reduction); 2～3 (modernizing/reinforcing nuclear forces which may not lead to increasing the number of nuclear weapons); 4 (not engaging in nuclear modernization/ reinforcement)
		(not applicable to the NNWS)
5. Diminishing the Role and Significance of Nuclear Weapons in National Security Strategies and Policies	**8**	
A) The current status of the roles and significance of nuclear weapons	(-8)	-7～-8 (judged based on the declaratory policy)
		(not applicable to the NNWS)
B) Commitment to "sole purpose," no first use, and related doctrines	(3)	0 (not adopting either policy); 2 (adopting a similar policy or expressing its will to adopt either policy in the future); 3 (already adopting either policy)
		(not applicable to the NNWS)
C) Negative security assurances	(2)	0 (not declaring); 1 (declaring with reservations); 2 (declaring without reservations)
		(not applicable to the NNWS)
D) Signing and ratifying the protocols of the treaties on nuclear-weapon-free zones	(3)	Add 0.5 point for the ratification of one protocol; a country ratifying all protocols marks 3 points
		(not applicable to countries expect NWS)
E) Relying on extended nuclear deterrence	(-5)	(not applicable to the NWS and Non-NPT Parties)
		(applied solely to the NNWS): -5 (a country relying on the nuclear umbrella and participating in nuclear sharing); -3 (a country relying on the nuclear umbrella); 0 (a country not relying on the nuclear umbrella)
6. De-alerting or Measures for Maximizing Decision Time to Authorize the Use of Nuclear Weapons	**4**	
De-alerting or measures for maximizing decision time to authorize the use of nuclear weapons	(4)	0～1 (maintaining a high alert level); 2 (maintaining a certain alert level); 3 (de-alerting during peacetime); add 1 point for implementing measures for increasing the credibility of (lowered) alert status
		(not applicable to the NNWS)
7. CTBT	**11**	
A) Signing and ratifying the CTBT	(4)	0 (not signing); 2 (not ratifying); 4 (ratifying)
B) Moratoria on nuclear test explosions pending CTBT's entry into force	(3)	0 (not declaring); 2 (declaring); 3 (declaring and closing the nuclear test sites)
		(not applicable to the NNWS)
C) Cooperation with the CTBTO Preparatory Commission	(2)	0 (no cooperation or no information); 1～2 (paying contributions, actively participating in meetings, and actively engaging in the outreach activities for the Treaty's entry into force)
D) Contribution to the development of the CTBT verification systems	(2)	Add 1 point for establishing and operating the IMS; add another 1 point for participating in the discussions on enhancing the CTBT verification capabilities

Evaluation criteria	Maximum points	Scale of measurement
E) Nuclear testing	(-3)	-3 (conducting nuclear test explosions in the past 5 years); -1 (conducting nuclear tests without explosion or the status is unclear); 0 (not conducting any nuclear tests) (not applicable to the NNWS)
8. FMCT	**10**	
A) Commitment, efforts, and proposals toward immediate commencement of negotiations on an FMCT	(5)	Add 1 (expressing a commitment); add 1～2 (actively engaging in the promotion of early commencement); add 1～2 (making concrete proposals on the start of negotiations)
B) Moratoria on the production of fissile material for use in nuclear weapons	(3)	0 (not declaring); 1 (not declaring but not producing fissile material for nuclear weapons); 2 (declaring); 3 (declaring and taking measures for the cessation of the production as declared) (not applicable to the NNWS)
C) Contribution to the development of verification measures	(2)	0 (no contribution or no information); 1 (proposing a research on verification measures); 2 (engaging in R&D for verification measures)
9. Transparency in Nuclear Forces, Fissile Material for Nuclear Weapons, and Nuclear Strategy/Doctrine	**6**	
Transparency in nuclear forces, fissile material for nuclear weapons, and nuclear strategy/ doctrine	(6)	Add 1～2 (disclosing the nuclear strategy/doctrine); add 1～2 (disclosing the status of nuclear forces); add 1～2 (disclosing the status of fissile material usable for nuclear weapons) (not applicable to the NNWS)
10. Verifications of Nuclear Weapons Reductions	**7**	
A) Acceptance and implementation of verification for nuclear weapons reduction	(3)	0 (not accepting or implementing); 2 (limited acceptance and implementation); 3 (accepting and implementing verification with comprehensiveness and completeness); deduct 1～2 points in case of non-compliance or problems in implementation (not applicable to the NNWS)
B) Engagement in research and development for verification measures of nuclear weapons reduction	(1)	0 (not engaging or no information); 1 (engaging in R&D)
C) The IAEA inspections to fissile material declared as no longer required for military purposes	(3)	0 (not implementing), 1 (limited implementation); 3 (implementing); add 1 point if a country engages in the efforts for implementing or strengthening the implementation, except in the case of already implementing (not applicable to the NNWS)
11. Irreversibility	**7**	
A) Implementing or planning dismantlement of nuclear warheads and their delivery vehicles	(3)	0 (not implementing or no information); 1 (perhaps implementing but not clear); 2～3 (implementing) (not applicable to the NNWS)

Evaluation criteria	Maximum points	Scale of measurement
B) Decommissioning/conversion of nuclear weapons-related facilities	(2)	0 (not implementing or no information); 1 (implementing in a limited way); 2 (implementing extensively) (not applicable to the NNWS)
C) Measures for fissile material declared excess for military purposes, such as disposition or conversion to peaceful purposes	(2)	0 (not implementing or no information); 1 (implementing in a limited way); 2 (implementing); 3 (implementing extensively) (not applicable to the NNWS)
12. Disarmament and Non-Proliferation Education and Cooperation with Civil Society	**4**	
Disarmament and non-proliferation education and cooperation with civil society	(4)	Add 1 (participating in the joint statement or mentioning at the NPT PrepCom/ Revcon, etc); add 1～2 (implementing disarmament and non-proliferation education); add 1～2 (cooperating with civil society) Maximum 4 points
13. Hiroshima and Nagasaki Peace Memorial Ceremonies	**1**	
Hiroshima and Nagasaki Peace Memorial Ceremonies	(1)	0 (not attending); 0.5 (not attending in 2018 but has attended at least once during the past 3 years); 1 (attending any one of the ceremonies)

[Nuclear Non-Proliferation]

Evaluation criteria	Maximum points	Scale of measurement
1. Acceptance and Compliance with Nuclear Non-Proliferation Obligations	**20**	
A) Accession to the NPT	(10)	0 (not signing or declaring withdrawal); 3 (not ratifying); 10 (in force)
B) Compliance with Articles I and II of the NPT and the UNSC resolutions on non-proliferation	(7)	0 (non-complying with Article I and II of the NPT); 3～4 (having not yet violated Article I and II of the NPT but displaying behaviors that raise concerns about proliferation, or not complying with the UNSC resolutions adopted for relevant nuclear issues); 5 (taking concrete measures for solving the non-compliance issue); 7 (complying) As for the non-NPT states (maximum 3 points) : 2 (not complying with the UNSC resolutions adopted for relevant nuclear issues); 3 (other cases)
C) Nuclear-Weapon-Free Zones	(3)	1 (signing the NWFZ treaty); 3 (ratifying the treaty)
2. IAEA Safeguards Applied to the NPT NNWS	**18**	
A) Signing and ratifying a Comprehensive Safeguards Agreement	(4)	0 (not signing); 1 (not ratifying); 4 (in force)
B) Signing and ratifying an Additional Protocol	(5)	0 (not signing); 1 (not ratifying); 3 (provisional application); 5 (in force)
C) Implementation of the integrated safeguards	(4)	0 (not implementing); 2 (broader conclusion); 4 (implementing)
D) Compliance with IAEA Safeguards Agreement	(5)	0 (not resolving the non-compliance issue); 2 (taking concrete measures for solving the non-compliance issue); 5 (complying)

Evaluation criteria	Maximum points	Scale of measurement
3. IAEA Safeguards Applied to NWS and Non-Parties to the NPT	**7**	
A) Application of the IAEA safeguards (Voluntary Offer Agreement or INFCIRC/66) to their peaceful nuclear in facilities	(3)	0 (not applying); 2 (applying INFCIRC/66); 3 (applying Voluntary Offer Agreement)
B) Signing, ratifying, and implementing the Additional Protocol	(4)	0 (not signing); 1 (not ratifying); 3 (in force); add 1 point if widely applied to peaceful nuclear activities
4. Cooperation with the IAEA	**4**	
Cooperation with the IAEA	(4)	Add 1 (contributing to the development of verification technologies); add 1～2 (contributing to the universalization of the Additional Protocol); add 1 (other efforts)
5. Implementing Appropriate Export Controls on Nuclear-Related Items and Technologies	**15**	
A) Establishment and implementation of the national control systems	(5)	0 (not establishing); 1 (establishing but insufficient); 2 (establishing a system to a certain degree); 3 (establishing an advanced system, including the Catch-all); add 1～2 (if continuing to implement appropriate export controls); deduct 1～2 (not adequately implementing)
B) Requiring the conclusion of the Additional Protocol for nuclear export	(2)	0 (not requiring or no information); 1 (requiring for some cases); 2 (requiring)
C) Implementation of the UNSCRs concerning North Korean and Iranian nuclear issues	(3)	0 (not implementing or no information); 2 (implementing); 3 (actively implementing); deduct 1～3 (depending on the degree of violation)
D) Participation in the PSI	(2)	0 (not participating); 1 (participating); 2 (actively participating)
E) Civil nuclear cooperation with non-parties to the NPT	(3)	0 (exploring active cooperation); 1～2 (contemplating cooperation, subject to implementing additional nuclear disarmament and non-proliferation measures); 3 (showing a cautious attitude or being against it)
6. Transparency in the Peaceful Use of Nuclear Energy	**4**	
A) Reporting on the peaceful nuclear activities	(2)	0 (not reporting or no information); 1 (reporting but insufficiently); 2 (reporting)
B) Reporting on plutonium management	(2)	0 (not reporting or no information); 1 (reporting); 2 (reporting on not only plutonium but also uranium); add 1 (ensuring a high level of transparency in plutonium although not being obliged to report)

[Nuclear Security]

Evaluation criteria	Maximum points	Scale of measurement
1. The Amount of Fissile Material Usable for Weapons	**-16**	
The amount of fissile material usable for weapons	(-16)	Firstly, -3 (if possessing fissile material usable for nuclear weapons). Then, deduct if: ・ HEU: -5 (>100t); -4 (>20t); -3 (>10t); -2 (>1t); -1 (possessing less than 1t) ・Weapon-grade Pu: -5 (>100t); -4 (>20t); -3 (>10t); -2 (>1t); -1 (possessing less than 1t) ・Reactor-grade Pu: -3 (>10t); -2 (>1t); -1 (possessing less than 1t)

Evaluation criteria	Maximum points	Scale of measurement
2. Status of Accession to Nuclear Security and Safety-Related Conventions, Participation in Nuclear Security Related Initiatives, and Application to Domestic Systems	**21**	
A) Convention on the Physical Protection of Nuclear Material and the 2005 Amendment to the Convention	(3)	0 (not signing the Treaty); 1 (not ratifying the Treaty); 2 (Treaty in force, not ratifying the Amendment); 3 (both the Treaty and Amendment in force)
B) International Convention for the Suppression of Acts of Nuclear Terrorism	(2)	0 (not signing); 1 (not ratifying); 2 (in force)
C) Convention on Nuclear Safety	(2)	0 (not signing); 1 (not ratifying); 2 (in force)
D) Convention on Early Notification of a Nuclear Accident	(2)	0 (not signing); 1 (not ratifying); 2 (in force)
E) Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management	(2)	0 (not signing); 1 (not ratifying); 2 (in force)
F) Convention on Assistance in Case of a Nuclear Accident or Radiological Emergency	(2)	0 (not signing); 1 (not ratifying); 2 (in force)
G) INFCIRC/225/Rev.5	(4)	0 (not applying or no information); 2 (applying to the national implementation system); 4 (applying and implementing adequately)
H) Enactment of laws and establishment of regulations for the national implementation	(4)	0 (not establishing domestic laws and regulations and the national implementation system); 1～2 (establishing them but insufficiently); 4 (establishing appropriately)
3. Efforts to Maintain and Improve the Highest Level of Nuclear Security	**20**	
A) Minimization of HEU and Plutonium stockpile in civilian use	(4)	0 (no effort or no information); 1 (limited efforts); 3 (active efforts); add 1 (committed to further enhancement)
B) Prevention of illicit trafficking	(5)	0 (not implementing or no information); 2 (limited implementation); 4 (active implementation); add 1 (committed to further enhancement)
C) Acceptance of international nuclear security review missions	(2)	0 (not accepting or no information); 1 (accepting); 2 (actively accepting)
D) Technology development —nuclear forensics	(2)	0 (not implementing or no information); 1 (implementing); 2 (actively implementing)
E) Capacity building and support activities	(2)	0 (not implementing or no information); 1 (implementing); 2 (actively implementing)
F) IAEA Nuclear Security Plan and Nuclear Security Fund	(2)	0 (no effort or information); 1 (participating); 2 (actively participating)
G) Participation in international efforts	(3)	0 (not participating); 1 (participating in a few frameworks); 2 (participating in many or all frameworks); add 1 (if contributing actively)

As for the evaluation section, a set of objective evaluation criteria is established by which the respective country's performance is assessed. Along with the adoption of the Treaty on the Prohibition of Nuclear Weapons (TPNW), its signature and ratification status was newly added to the evaluation item in the *Hiroshima Report 2018*.

The Research Committee of this project recognizes the difficulties, limitations and risk of "scoring" countries' performances. However, the Committee also considers that an indicative approach is useful to draw attention to nuclear issues, so as to prompt debates over priorities and urgency.

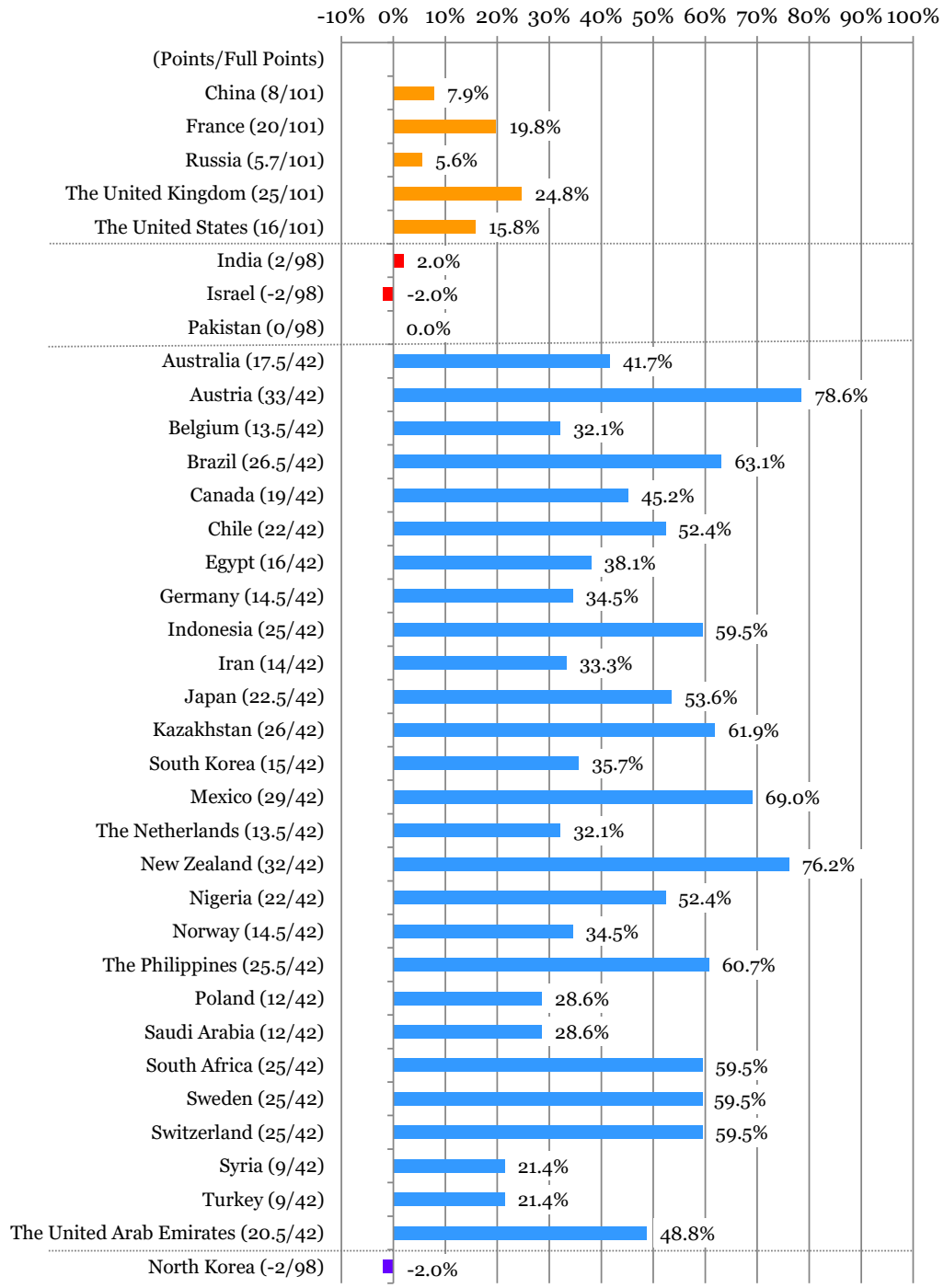
The different numerical value within each category (i.e., nuclear disarmament, nuclear non-proliferation and nuclear security) reflects each activity's importance within that area, as determined through deliberation by the Research Committee of this project. However, the differences in the scoring arrangements within each of the three categories does not necessarily reflect its relative significance in comparison with others, as it has been driven by the differing number of items surveyed. Thus, the value assigned to nuclear disarmament (full points 101) does not mean that it is more than twice as important as nuclear non-proliferation (full points 61) or nuclear security (full points 41).

Regarding "the number of nuclear weapons" (in the nuclear disarmament section) and "the amount of fissile material usable for nuclear weapons" (in the nuclear security section), the assumption is that the more nuclear weapons or weapons-usable fissile material a country possesses, the greater the task of reducing them and ensuring their security. However, the Research Committee recognizes that "numbers" or "amounts" are not the sole decisive factors. It is definitely true that other factors—such as implications of missile defense, chemical and biological weapons, or conventional force imbalance and a psychological attachment to a minimum overt or covert nuclear weapon capability—would affect the issues and the process of nuclear disarmament, non-proliferation and nuclear security. However, they were not included in our criteria for evaluation because it was difficult to make objective scales of the significance of these factors. In addition, in view of the suggestions and comments made to the *Hiroshima Report 2013*, the Research Committee modified criteria of the following items: current status of the roles and significance of nuclear weapons in national security strategies and policies; reliance on extended nuclear deterrence; and nuclear testing.

After all, there is no way to mathematically compare the different factors contained in the different areas of disarmament, non-proliferation and nuclear security. Therefore, the evaluation points should be taken as indicative of the performances in general but by no means as an exact representation or precise assessment of different countries' performances. Since the *Hiroshima Report 2014*, such items as "relying on extended nuclear deterrence" and "nuclear testing" have been negatively graded if applicable.

Chapter 1. Area Summary

(1) Nuclear Disarmament



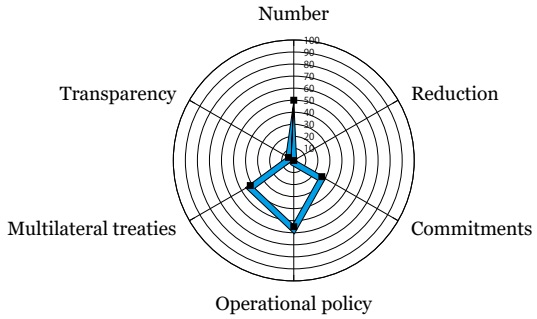
6-point Nuclear Disarmament Radar Charts

For the NWS, radar charts were produced to illustrate where each country stands in different aspects of nuclear disarmament. For this purpose the 12 issues used for nuclear disarmament evaluation were grouped into six aspects: (1) the number of nuclear weapons, (2) reduction of nuclear weapons, (3) commitment to achieving a "world without nuclear weapons," (4) operational policy, (5) the status of signature and ratification of, or attitudes of negotiation to relevant multilateral treaties, and (6) transparency.

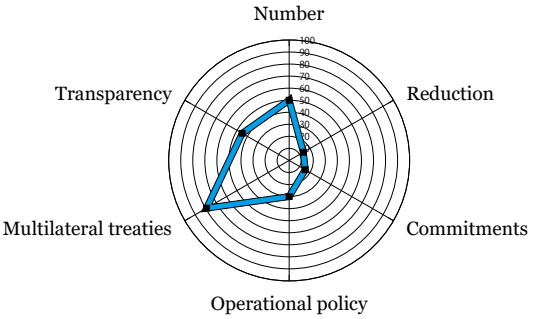
According to the following radar charts illustrating where each nuclear-weapon state stands in different aspects of nuclear disarmament, China is required to improve its efforts for nuclear weapons reduction and transparency. To a lesser extent, France could be more transparent regarding its nuclear weapons-related issues. Russia and the United States are urged to undertake further reductions of their nuclear arsenals. The performances of the United Kingdom are relatively well-balanced.

Aspects	Issues
Number	Number of nuclear weapons
Reduction	Reduction of nuclear weapons
Commitments	Treaty on the Prohibition of Nuclear Weapons (TPNW)
	Commitments to achieving a world without nuclear weapons
	Disarmament and non-proliferation educations and cooperation with the civil society
	Hiroshima and Nagasaki Peace Memorial Ceremonies
Operational policy	Diminishing roles and significance of nuclear weapons in the national security strategies and policies
	De-alerting, or measures for maximizing decision time to authorize the use of nuclear weapons
Multilateral treaties	Comprehensive Nuclear-Test-Ban Treaty (CTBT)
	Fissile Material Cut-Off Treaty (FMCT)
Transparency	Transparency regarding nuclear forces, fissile material for nuclear weapons, and nuclear strategy/doctrine
	Verifications of nuclear weapons reductions
	Irreversibility

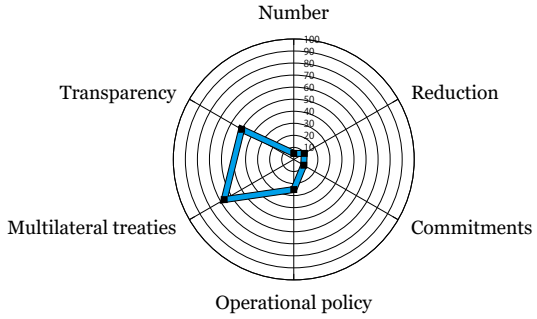
[China]



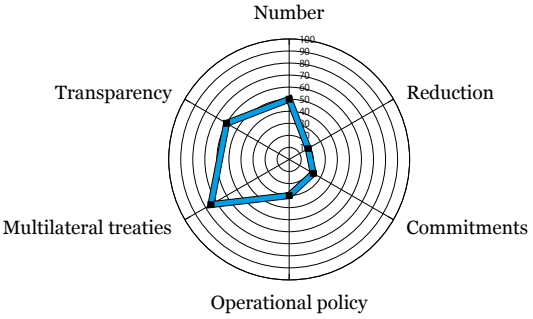
[France]



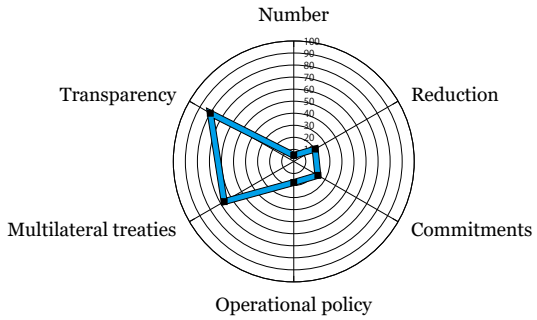
[Russia]



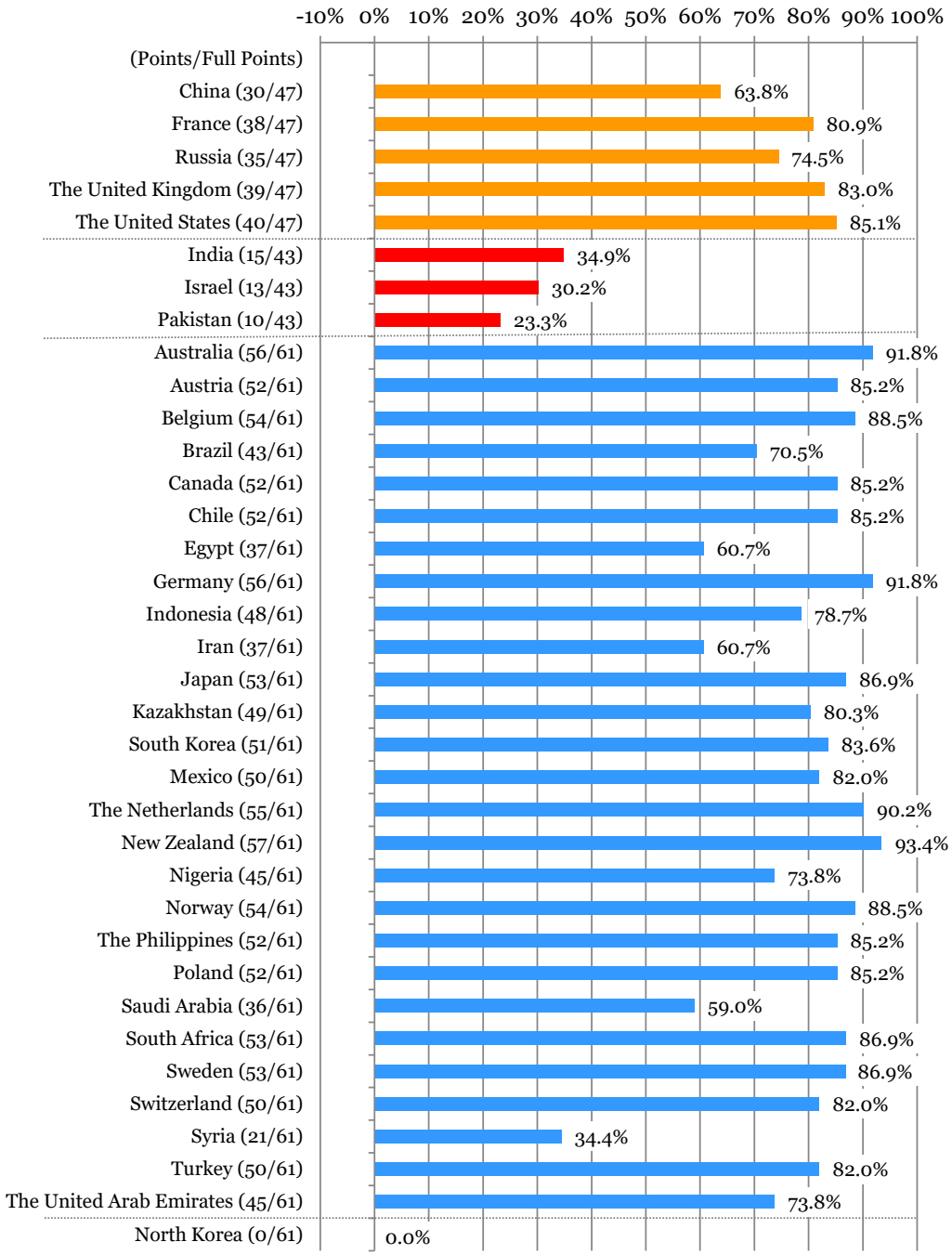
[The United Kingdom]



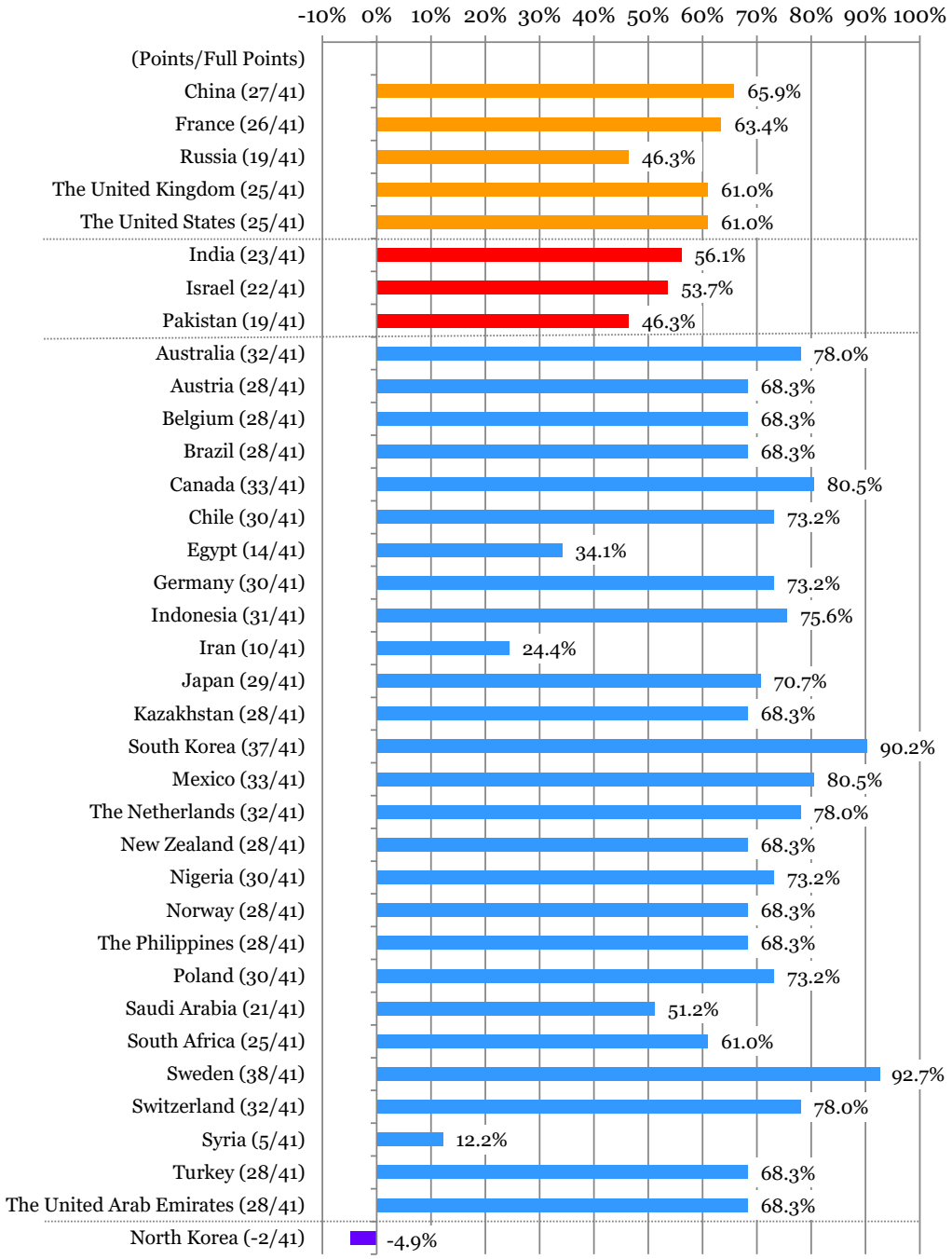
[The United States]



(2) Nuclear Non-Proliferation



(3) Nuclear Security



Chapter 2. Country-by-Country Summary

(1) Nuclear-Weapon States

1. China ■ Nuclear-Weapon State

Nuclear Disarmament	8 Points	Full Points 101	7.9 %
	Change compared to the *Hiroshima Report 2018* -2		

China, which is the only NWS that has not reduced its nuclear arsenals, possessing approximately 280 nuclear warheads, has promoted active modernization programs for its nuclear forces (particularly, ICBMs and SLBMs). It has not signed the TPNW. While China has not yet ratified the CTBT, establishing the stations for international monitoring system (IMS) has gradually advanced. Meanwhile, it was reported that China conducted simulations for nuclear explosions and construction of a facility for non-explosive tests. China continues not to declare a moratorium on production of fissile material for nuclear weapons. It has declared no first use of nuclear weapons and the unconditional negative security assurance. While arguing the importance of transparency in intention, China has maintained the least transparency about nuclear weapons capabilities among the NWS.

Nuclear Non-Proliferation	30 Points	Full Points 47	63.8 %
	Change compared to the *Hiroshima Report 2018* -1		

China acceded to the IAEA Additional Protocol, in which no provision for complementary access visits is stipulated. It has announced to take efforts to strengthen implementation of sanction measures vis-à-vis North Korea under the UN Security Council Resolutions, as well as its export-control mechanisms. Questions remain as to whether China is conducting adequate and strict implementation, however. China has also been criticized for exporting two nuclear power reactors to Pakistan, which may constitute a violation of the NSG guidelines.

Nuclear Security	27 Points	Full Points 41	65.9 %
	Change compared to the *Hiroshima Report 2018* +2		

China has ratified all nuclear security- and safety-related conventions and has also advanced legislation based on INFCIRC/225/Rev.5. China is actively engaged in strengthening nuclear security, including international cooperation to minimize the use of HEU and emphasis on capacity building through utilization of the COE.

2. France ■ Nuclear-Weapon State

Nuclear Disarmament	**20** Points	Full Points **101**	**19.8** %
	Change compared to the *Hiroshima Report 2018*		**-3**

France has announced its maximum number of nuclear warheads as 300, and has reduced its overall nuclear forces. It has also converted fissile material excess for military purpose to civilian purposes, which has been placed under the international safeguards. It voted against most of the UNGA Resolutions regarding nuclear disarmament, and showed a negative attitude to the issues on humanitarian dimensions, as well as legal prohibition of nuclear weapons, in particular. It has not signed the TPNW. There was little progress in diminishing the role of nuclear weapons.

Nuclear Non-Proliferation	**38** Points	Full Points **47**	**80.9** %
	Change compared to the *Hiroshima Report 2018*		**-2**

France acceded to the IAEA Additional Protocol, with the provision for complementary access visits. All of its civilian nuclear material covered by the EURATOM Treaty is subject to its safeguards. France has engaged in nuclear non-proliferation proactively, including contributions to the IAEA safeguards systems, and the establishment and implementation of its export control systems.

Nuclear Security	**26** Points	Full Points **41**	**63.4** %
	Change compared to the *Hiroshima Report 2018*		**0**

France has ratified all nuclear security- and safety-related conventions. In addition, France continues to implement the recommendation measures of INFCIRC/225/Rev.5 and is active in strengthening nuclear security, including involvement in international efforts such as nuclear forensics. In 2018 France also accepted an IPPAS follow-up mission.

3. Russia ■ Nuclear-Weapon State

Nuclear Disarmament	**5.7** Points	Full Points **101**	**5.6 %**
	Change compared to the *Hiroshima Report 2018*		**-2.1**

The number of Russia's nuclear weapons has been reduced. It also continues to implement the New START, and proposed its five-year extension. Still, it is estimated to possess approximately 6,850 nuclear warheads, and has actively developed and deployed new ICBMs and SLBMs for replacing aged delivery vehicles, as well as hypersonic boost glide weapons and nuclear-powered torpedo. Furthermore, Russia is alleged to have violated the INF Treaty. It voted against most of the UNGA Resolutions regarding nuclear disarmament, and showed a negative attitude to the issues on humanitarian dimensions as well as legal prohibition of nuclear weapons, in particular. It has not signed the TPNW.

Nuclear Non-Proliferation	**35** Points	Full Points **47**	**74.5 %**
	Change compared to the *Hiroshima Report 2018*		**0**

Russia acceded to the IAEA Additional Protocol, in which no provision for complementary access visits is stipulated. It considers that the conclusion of an Additional Protocol should be voluntary. Russia supported a proposal by the Arab states on convening a UN conference on a WMD-free zone in the Middle East.

Nuclear Security	**19** Points	Full Points **41**	**46.3 %**
	Change compared to the *Hiroshima Report 2018*		**0**

Russia has ratified all nuclear security- and safety-related conventions and has adopted the recommendation measures of INFCIRC/225/Rev.5. In 2018 Russia also contributed to international efforts to strengthen nuclear security, including co-chairing the Implementation and Assessment Group (IAG) meeting of the Global Initiative to Combat Nuclear Terrorism (GICNT) with the United States.

4. The United Kingdom ■ Nuclear-Weapon State

Nuclear Disarmament	25 Points	Full Points 101	24.8 %
	Change compared to the *Hiroshima Report 2018*		0

The size of the U.K. nuclear arsenal has decreased incrementally. The United Kingdom plans to reduce to no more than 120 operationally available warheads and a total stockpile of no more than 180 warheads by the mid-2020s. Construction of a new class of four SSBNs, as replacement for the existing Vanguard-class vessels, was commenced. It has not signed the TPNW. Meanwhile, the United Kingdom has engaged in joint developmental works on nuclear disarmament verification measures with the United States and Norway, respectively.

Nuclear Non-Proliferation	39 Points	Full Points 47	83.0 %
	Change compared to the *Hiroshima Report 2018*		0

The United Kingdom acceded to the IAEA Additional Protocol with the provision for complementary access visits. All of its civilian nuclear material is subject to the international safeguards. The United Kingdom and the IAEA signed a new safeguards agreement along with an Additional Protocol, for replacing the existing EURATOM safeguards when the United Kingdom withdraws from it. It has proactively engaged in nuclear non-proliferation, including implementation of export controls.

Nuclear Security	25 Points	Full Points 41	61.0 %
	Change compared to the *Hiroshima Report 2018*		0

The United Kingdom has ratified all nuclear security- and safety-related conventions and has adopted the recommendation measures of INFCIRC/225/Rev.5. In addition to holding nuclear forensics training in the framework of the GICNT in 2018, the United Kingdom is focusing on multilateral cooperation to strengthen nuclear security, such as expressing contributions to the Nuclear Security Fund (NSF) of the IAEA.

5. The United States ■ Nuclear-Weapon State

Nuclear Disarmament	16 Points	Full Points 101	15.8 %
	Change compared to the *Hiroshima Report 2018*		-0.7

The Unied States possesses 6,450 nuclear warheads, and continues to dismantle retired warheads. In October, it announced to withdraw from the INF Treaty. While the Unied States continues to implement the New START, it has yet to indicate its position regarding its extension. The Unied States has not signed the TPNW. In the meantime, it proposed a Creating the Conditions for Nuclear Disarmament (CCND). In its new Nuclear Posture Review (NPR), the Unied States implies to rely more on nuclear deterrence by, inter alia, reserving a possibility to use nuclear weapons against non-nuclear strategic attacks, and developing nuclear sea-launched cruise missiles (SLCMs), as well as low-yield nuclear warheads for SLBMs. Negative responses to the CTBT have also gradually appeared, including shortening the lead time for resuming a nuclear test, as well as conducting a subcritical test in late 2017. The Unied States remains the most transparent among the NWS on nuclear issues. It has established and led the "International Partnership for Nuclear Disarmament Verification (IPNDV)."

Nuclear Non-Proliferation	40 Points	Full Points 47	85.1 %
	Change compared to the *Hiroshima Report 2018*		-1

The Unied States has proactively led the efforts to bolster nuclear non-proliferation, including contributions to the IAEA safeguards systems and implementation of stringent export controls. It acceded to the IAEA Additional Protocol with the provision for complementary access visits. In June, the Unied States convened the first summit meeting with North Korea. On the other hand, it announced to withdraw from the JCPOA in May and reimpose sanctions against Iran.

Nuclear Security	25 Points	Full Points 41	61.0 %
	Change compared to the *Hiroshima Report 2018*		+1

The United States has ratified all nuclear security- and safety-related conventions and has adopted the recommendation measures of INFCIRC/225/Rev.5. Through the Global Threat Reduction Initiative (GTRI), the United States has promoted international efforts, such as cooperation to minimize the use of HEU, for many years. In 2018, the United States co-chaired with Russia at the GICNT IAG meeting, and efforts to directly support the IAEA, such as the recycling of nuclear material mainly used for medical purposes, also contributed to the strengthening of the global nuclear security standards.

(2) Non-Parties to the NPT

6. India ■ Non-Party to the NPT

Nuclear Disarmament	**2** Points	Full Points **98**	**2.0** %
	Change compared to the *Hiroshima Report 2018*		**-2**

India is estimated to possess approximately 130-140 nuclear warheads, having added incrementally. It also continues to actively develop nuclear delivery vehicles, including ICBM and SLBM, and to produce fissile material for nuclear weapons. Its first domestically built nuclear-powered submarine completed a 'deterrence patrol." India voted positively to some extent in the UNGA Resolutions regarding nuclear disarmament. However, it has not signed the TPNW. India maintains a moratorium on nuclear test explosions, but refuses to sign the CTBT.

Nuclear Non-Proliferation	**15** Points	Full Points **43**	**34.9** %
	Change compared to the *Hiroshima Report 2018*		**0**

India acceded to the IAEA Additional Protocol, in which no provision for complementary access visits is stipulated. India's quest for membership in the NSG is supported by some member states, but the group has not yet made a decision.

Nuclear Security	**23** Points	Full Points **41**	**56.1** %
	Change compared to the *Hiroshima Report 2018*		**+1**

Apart from the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, India has ratified all nuclear security- and safety-related conventions, and contributes to capacity building through the activities at its COE.

7. Israel ■ Non-Party to the NPT

Nuclear Disarmament	**-2** Points	Full Points **98**	**-2.0** %
	Change compared to the *Hiroshima Report 2018*		**-2**

Israel has consistently pursued the policy of "nuclear opacity" while estimated to possess approximately 80 nuclear warheads. Due to such a policy, its nuclear capabilities and posture remain unclear. Israel has yet to ratify the CTBT. Nor has it declared a moratorium on production of fissile material for nuclear weapons. It voted against most of the UNGA Resolutions regarding nuclear disarmament. Israel has not signed the TPNW.

Nuclear Non-Proliferation	**13** Points	Full Points **43**	**30.2** %
	Change compared to the *Hiroshima Report 2018*		**0**

Israel argues that improvement of the regional security is imperative for establishing a Middle East Zone Free of WMD. It voted against the UNGA resolution "Establishment of a nuclear-weapon-free zone in the region of the Middle East" for the first time since 1980. It has established solid export control systems. However, Israel has not acceded to the IAEA Additional Protocol.

Nuclear Security	**22** Points	Full Points **41**	**53.7** %
	Change compared to the *Hiroshima Report 2018*		**0**

Israel is adopting the recommendation measures of INFCIRC/225/Rev.5, and is also participating in multilateral nuclear security-related activities through the GICNT.

8. Pakistan ■ Non-Party to the NPT

Nuclear Disarmament	**0** Points	Full Points **98**	**0.0** %
	Change compared to the *Hiroshima Report 2018* **-2**		

Pakistan seems to be increasing its nuclear arsenal incrementally, and is estimated to possess 140-150 nuclear warheads. In addition to continuing to develop short- and medium-range ballistic missiles, it revealed possession of low-yield, small nuclear weapons. Such developments raise concerns about the increased possibility for early use of nuclear weapons. It has not signed the TPNW. While maintaining a moratorium on nuclear test explosions, it refuses to sign the CTBT. Pakistan continues to block the commencement of negotiations on an FMCT at the CD. It has yet to declare a moratorium on production of fissile material for nuclear weapons.

Nuclear Non-Proliferation	**10** Points	Full Points **43**	**23.3** %
	Change compared to the *Hiroshima Report 2018* **0**		

Pakistan has not yet acceded to the IAEA Additional Protocol. It argues that it has made efforts to enhance its export control systems: however, it is still unclear how robust or successfully implemented such export control systems are in practice.

Nuclear Security	**19** Points	Full Points **41**	**46.3** %
	Change compared to the *Hiroshima Report 2018* **+1**		

Pakistan is adopting the recommendation measures of INFCIRC/225/Rev.5, and contributes to capacity building through the activities at its COE in cooperation with the IAEA.

(3) Non-Nuclear-Weapon States

9. Australia ■ Non-Nuclear-Weapon State

Nuclear Disarmament	17.5 Points	Full Points 42	41.7 %
	Change compared to the *Hiroshima Report 2018*		0

Along with other U.S. allies, Australia advocates the "progressive approach" toward a world without nuclear weapons, through incremental, practical measures. Australia has engaged in promoting the CTBT's entry into force, and developing its verification systems. It has not signed the TPNW.

Nuclear Non-Proliferation	56 Points	Full Points 61	91.8 %
	Change compared to the *Hiroshima Report 2018*		0

Australia is also a state party to the South Pacific Nuclear-Free Zone Treaty. It acceded to the IAEA Additional Protocol, and has been applied the integrated safeguards. Australia-India Nuclear Cooperation Agreement was adopted in 2015.

Nuclear Security	32 Points	Full Points 41	78.0 %
	Change compared to the *Hiroshima Report 2018*		0

Australia has ratified all nuclear security- and safety-related conventions and has adopted the recommendation measures of INFCIRC/225/Rev.5. Australia also cooperates in strengthening the global nuclear security standards in the context of multilateral cooperation.

10. Austria ■ Non-Nuclear-Weapon State

Nuclear Disarmament	33 Points	Full Points 42	78.6 %
	Change compared to the *Hiroshima Report 2018*		+3

Austria has played a leading role for promoting the issue on the humanitarian dimensions of nuclear weapons, and adopting the TPNW. It has already ratified the treaty. It has also proactively engaged in cooperation with the civil society.

Nuclear Non-Proliferation	52 Points	Full Points 61	85.2 %
	Change compared to the *Hiroshima Report 2018*		0

Austria has participated in and implemented the related treaties and measures. It acceded to the IAEA Additional Protocol, and has been applied the integrated safeguards.

Nuclear Security	28 Points	Full Points 41	68.3 %
	Change compared to the *Hiroshima Report 2018*		0

Austria has ratified all nuclear security- and safety-related conventions and is also involved in the minimization of the HEU and the prevention of illicit trafficking.

11. Belgium ■ Non-Nuclear-Weapon State

Nuclear Disarmament	**13.5** Points	Full Points **42**	**32.1 %**
	Change compared to the *Hiroshima Report 2018*		**0**

Belgium is hosting U.S. non-strategic nuclear weapons as part of NATO's nuclear sharing policy. It has not signed the TPNW. Along with other U.S. allies, Belgium advocates the "progressive approach" toward a world without nuclear weapons, through implementing practical measures. It has engaged in promoting the CTBT's entry into force, and developing its verification systems.

Nuclear Non-Proliferation	**54** Points	Full Points **61**	**88.5 %**
	Change compared to the *Hiroshima Report 2018*		**0**

Belgium acceded to the IAEA Additional Protocol, and has been applied the integrated safeguards. It has engaged in non-proliferation, including the establishment of the solid export control systems.

Nuclear Security	**28** Points	Full Points **41**	**68.3 %**
	Change compared to the *Hiroshima Report 2018*		**0**

Belgium has ratified all nuclear security- and safety-related conventions and is also working on the introduction of the recommendation measures of INFCIRC/225/Rev.5, in particular the protection measures for sabotage actions against nuclear materials and related facilities. Belgium plans to accept an IPPAS mission in 2019.

12. Brazil ■ Non-Nuclear-Weapon State

Nuclear Disarmament	**26.5** Points	Full Points **42**	**63.1 %**
	Change compared to the *Hiroshima Report 2018*		**-0.5**

Brazil has played a leading role for adopting the TPNW, which it has signed. It voted for most of the UNGA Resolutions regarding nuclear disarmament.

Nuclear Non-Proliferation	**43** Points	Full Points **61**	**70.5 %**
	Change compared to the *Hiroshima Report 2018*		**0**

Brazil is also a state party to the Latin America Nuclear-Weapon-Free Zone Treaty. While it complies with nuclear non-proliferation obligations, Brazil continues to be reluctant about accepting the IAEA Additional Protocol. It considers that the conclusion of an Additional Protocol should be voluntary.

Nuclear Security	**28** Points	Full Points **41**	**68.3 %**
	Change compared to the *Hiroshima Report 2018*		**0**

Brazil has ratified all nuclear- and safety-related conventions, except the CPPNM Amendment. It has been working on the introduction of the recommendation measures of INFCIRC/225/Rev.5, in particular the protection measures for sabotage actions against nuclear materials and related facilities.

13. Canada ■ Non-Nuclear-Weapon State

Nuclear Disarmament	19 Points	Full Points 42	45.2 %
	Change compared to the *Hiroshima Report 2018*		0

Along with other U.S. allies, it advocates the "progressive approach" toward a world without nuclear weapons, through implementing practical measures. It has not signed the TPNW. Canada has engaged in promoting the CTBT's entry into force, and developing its verification systems. Canada has also undertaken active cooperation with civil society.

Nuclear Non-Proliferation	52 Points	Full Points 61	85.2 %
	Change compared to the *Hiroshima Report 2018*		0

Canada acceded to the IAEA Additional Protocol, and has been applied the integrated safeguards. Canada exported uranium to India, as their civil nuclear cooperation.

Nuclear Security	33 Points	Full Points 41	80.5 %
	Change compared to the *Hiroshima Report 2018*		0

Canada has ratified all nuclear security- and safety-related conventions and has adopted the recommendation measures of INFCIRC/225/Rev.5. Canada has actively engaged in multilateral efforts to strengthen nuclear security, such as funding for the removal of radiation sources for medical purposes and support for the sustainable management of sealed sources.

14. Chile ■ Non-Nuclear-Weapon State

Nuclear Disarmament	22 Points	Full Points 42	52.4 %
	Change compared to the *Hiroshima Report 2018*		-4.5

Chile voted for most of the UNGA Resolutions regarding nuclear disarmament, and has expressed approval of the issues on the humanitarian dimensions and legal prohibition of nuclear weapons. It also signed the TPNW.

Nuclear Non-Proliferation	52 Points	Full Points 61	85.2 %
	Change compared to the *Hiroshima Report 2018*		0

Chile is also a state party to the Latin America Nuclear-Weapon-Free Zone Treaty. It has acceded to the IAEA Additional Protocol, and has been applied the integrated safeguards. Meanwhile, more efforts are needed to strengthen its nuclear-related export controls system.

Nuclear Security	30 Points	Full Points 41	73.2 %
	Change compared to the *Hiroshima Report 2018*		0

Chile has ratified all nuclear security- and safety-related conventions and has adopted the recommendation measures of INFCIRC/225/Rev.5. In recent years, Chile has been working on preventing illicit trafficking and minimizing the use of HEU.

15. Egypt ■ Non-Nuclear-Weapon State

Nuclear Disarmament	16 Points	Full Points 42	38.1 %
	Change compared to the *Hiroshima Report 2018*		-2

Egypt voted for most of the UNGA Resolutions regarding nuclear disarmament, and has expressed approval of the issues on the humanitarian dimensions and legal prohibition of nuclear weapons. However, it has not yet signed the TPNW. Nor has it actively engaged in promotion of nuclear disarmament. Egypt has not ratified the CTBT, either.

Nuclear Non-Proliferation	37 Points	Full Points 61	60.7 %
	Change compared to the *Hiroshima Report 2018*		0

Egypt has been active toward establishing a WMD-free zone in the Middle East, and taken an initiative to adopt the UNGA decision on convening a UN conference on a WMD-free zone in the Middle East. Meanwhile, it has yet to conclude the IAEA Additional Protocol. Egypt has made efforts for, inter alia, putting export control legislation in place and setting enforcement agencies. Still, its export controls remain at an insufficient level, due to a lack of introduction of important elements including list control and catch-all control provisions. While signing, it has not yet ratified the Africa Nuclear-Weapon-Free Zone Treaty.

Nuclear Security	14 Points	Full Points 41	34.1 %
	Change compared to the *Hiroshima Report 2018*		0

Egypt has signed the CPPNM, the CPPNM Amendment, the Nuclear Terrorism Convention, etc., but has not yet ratified these conventions. In recent years, Egypt has been working on the development of legal instruments on the prevention of illicit trafficking, and the spread of a nuclear security culture through the activities of its COE.

16. Germany ■ Non-Nuclear-Weapon State

Nuclear Disarmament	14.5 Points	Full Points 42	34.5 %
	Change compared to the *Hiroshima Report 2018*		+0.5

While Germany has proactively engaged in nuclear disarmament, it was against, or abstained, in the votes on the other UNGA Resolutions related to the humanitarian dimensions as well as legal prohibition of nuclear weapons. It has not signed the TPNW. Along with other U.S. allies, Germany advocates the "progressive approach" toward a world without nuclear weapons, through incremental practical measures. Germany is hosting U.S. non-strategic nuclear weapons as part of NATO's nuclear sharing policy.

Nuclear Non-Proliferation	56 Points	Full Points 61	91.8 %
	Change compared to the *Hiroshima Report 2018*		0

Germany acceded to the IAEA Additional Protocol, and has been applied the integrated safeguards. It has engaged in non-proliferation, including the establishment of solid export control systems.

Nuclear Security	30 Points	Full Points 41	73.2 %
	Change compared to the *Hiroshima Report 2018*		+2

Germany has ratified all nuclear security- and safety-related conventions. In addition, Germany continues to implement the recommendation measures of INFCIRC/225/Rev.5 and is active in strengthening nuclear security, including involvement in international efforts such as cyber and computer security. Germany has also made contributions to the NSF of the IAEA for many years.

17. Indonesia ■ Non-Nuclear-Weapon State

Nuclear Disarmament	25 Points	Full Points 42	59.5 %
	Change compared to the *Hiroshima Report 2018*		0

Indonesia has actively advocated promotion of nuclear disarmament at various nuclear disarmament fora, including the OEWG and the UNGA. It voted for most of the UNGA Resolutions regarding nuclear disarmament. Indonesia signed the TPNW.

Nuclear Non-Proliferation	48 Points	Full Points 61	78.7 %
	Change compared to the *Hiroshima Report 2018*		0

Indonesia is also a state party to the Southeast Asia Nuclear-Weapon-Free Zone Treaty. It has concluded the IAEA Additional Protocol, of which the NAM countries are less enthusiastic about acceptance. Indonesia is applied the integrated safeguards. On export controls, however, Indonesia has yet to prepare a list of dual-use items and technologies, or to implement catch-all control.

Nuclear Security	31 Points	Full Points 41	75.6 %
	Change compared to the *Hiroshima Report 2018*		+1

Indonesia has ratified all nuclear security- and safety-related conventions and is also working on the introduction of the recommendation measures of INFCIRC/225/Rev.5 including the development of legal instruments relevant to the nuclear security. Indonesia has completed the removal of the HEU in the country and is working to prevent illicit trafficking with the cooperation of the IAEA, and is also actively involved in capacity building through the activities of its COE.

18. Iran ■ Non-Nuclear-Weapon State

Nuclear Disarmament	14 Points	Full Points 42	33.3 %
	Change compared to the *Hiroshima Report 2018*		-1

Iran voted for most of the UNGA Resolutions regarding nuclear disarmament, including the UNGA resolution titled “Taking forward multilateral nuclear disarmament negotiations,” and other UNGA Resolutions related to the humanitarian dimensions as well as legal prohibition of nuclear weapons. However, it has not actively engaged in promotion of nuclear disarmament. Iran has neither ratified the CTBT nor signed the TPNW.

Nuclear Non-Proliferation	37 Points	Full Points 61	60.7 %
	Change compared to the *Hiroshima Report 2018*		0

Iran has complied with the Joint Comprehensive Plan of Action (JCPOA) agreed in July 2015, despite the U.S. withdraw from it and re-imposition of sanction against Iran. While Iran has not ratified the IAEA Additional Protocol, it has accepted its provisional application, under which the IAEA conducted complimentary access visits. Still, Iran warned against the U.S. pressure activities.

Nuclear Security	10 Points	Full Points 41	24.4 %
	Change compared to the *Hiroshima Report 2018*		0

Iran has made some progress in introducing the recommended measures of INFCIR/225/Rev.5. However, so far, no significant progress has been made in the ratification of nuclear security- and safety-related conventions, the minimization of use of the HEU and the participation in multilateral efforts on prevention of illicit trafficking.

19. Japan ■ Non-Nuclear-Weapon State

Nuclear Disarmament	22.5 Points	Full Points 42	53.6 %
	Change compared to the *Hiroshima Report 2018* -1		

Along with other U.S. allies, Japan advocates the "progressive approach" toward a world without nuclear weapons, through incremental practical measures. It has not signed the Treaty. Japan has proactively engaged in nuclear disarmament, as one of the countries that lead efforts to promote and strengthen those areas, particularly for achieving a world without nuclear weapons, promoting entry into force of the CTBT, and undertaking disarmament and non-proliferation education. Japan announced a voluntary contribution to the CTBTO for, inter alia, procuring and deploying a mobile noble gas detection system.

Nuclear Non-Proliferation	53 Points	Full Points 61	86.9 %
	Change compared to the *Hiroshima Report 2018* 0		

Japan has acceded to the IAEA Additional Protocol, and has been applied the integrated safeguards. It has proactively engaged in nuclear non-proliferation, including the establishment of solid export control systems and conducting outreach activities. The Japan-U.S. Nuclear Cooperation Agreement was automatically extended in July 2018. It announced a new policy on reducing the size of its plutonium stockpile.

Nuclear Security	29 Points	Full Points 41	70.7 %
	Change compared to the *Hiroshima Report 2018* 0		

Japan has ratified all nuclear security- and safety-related conventions and has adopted the recommendation measures of INFCIRC/225/Rev.5. In 2018, Japan revised the Basic Principles, upholding the principle of not possessing plutonium that does not have a specific purpose under the Atomic Energy Basic Act, and launched measures to reduce the size of its plutonium stockpile. In addition to accepting IPPAS follow-up missions, Japan is actively involved in capacity building utilizing its experienced COE (JAEA-ISCN).

20. Kazakhstan ■ Non-Nuclear-Weapon State

Nuclear Disarmament	26 Points	Full Points 42	61.9 %
	Change compared to the *Hiroshima Report 2018* +2		

Kazakhstan has actively advocated the importance of the CTBT. It voted for the UNGA Resolutions regarding nuclear disarmament, and has expressed approval of the issues on the humanitarian dimensions and legal prohibition of nuclear weapons. It has signed the TPNW.

Nuclear Non-Proliferation	49 Points	Full Points 61	80.3 %
	Change compared to the *Hiroshima Report 2018* +2		

Kazakhstan is also a state party to the Central Asia Nuclear-Weapon-Free Zone Treaty. It has acceded to the IAEA Additional Protocol, and has been applied the integrated safeguards. The IAEA LEU Fuel Bank established in Kazakhstan started to be operational in 2017.

Nuclear Security	28 Points	Full Points 41	68.3 %
	Change compared to the *Hiroshima Report 2018* +2		

Kazakhstan has ratified all nuclear security- and safety-related conventions, adopted the recommendation measures of INFCIRC/225/Rev.5, and is working on measures to prevent illicit trafficking.

21. South Korea ■ Non-Nuclear-Weapon State

Nuclear Disarmament	**15** Points	Full Points **42**	**35.7 %**
	Change compared to the *Hiroshima Report 2018*		**+1**

Along with other U.S. allies, South Korea advocates the "progressive approach" toward a world without nuclear weapons, through incremental practical measures. It has not signed the TPNW. South Korea has engaged in promoting the CTBT's entry into force, and developing its verification systems.

Nuclear Non-Proliferation	**51** Points	Full Points **61**	**83.6 %**
	Change compared to the *Hiroshima Report 2018*		**0**

South Korea convened summit meetings with North Korea three times in 2018. It acceded to the IAEA Additional Protocol, and has been applied the integrated safeguards. It has proactively engaged in the issue of how to make withdrawal from the NPT more difficult.

Nuclear Security	**37** Points	Full Points **41**	**90.2 %**
	Change compared to the *Hiroshima Report 2018*		**0**

South Korea has ratified all nuclear security- and safety-related conventions, adopted the recommendation measures of INFCIRC/225/Rev.5, and engaged in various multilateral efforts such as nuclear forensics cooperation.

22. Mexico ■ Non-Nuclear-Weapon State

Nuclear Disarmament	**29** Points	Full Points **42**	**69.0 %**
	Change compared to the *Hiroshima Report 2018*		**+1.5**

Mexico has played a leading role for promoting the issue on the humanitarian dimensions of nuclear weapons, as well as adopting the TPNW, which it has already ratified.

Nuclear Non-Proliferation	**50** Points	Full Points **61**	**82.0 %**
	Change compared to the *Hiroshima Report 2018*		**0**

Mexico is also a state party to the Latin America Nuclear-Weapon-Free Zone Treaty. Mexico acceded to the IAEA Additional Protocol, but has not yet been drawn a broader conclusion.

Nuclear Security	**33** Points	Full Points **41**	**80.5 %**
	Change compared to the *Hiroshima Report 2018*		**+3**

Mexico has newly ratified the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, and has completely ratified the nuclear security- and safety-related conventions. Mexico is also involved in multilateral efforts such as organizing IAEA's regional training courses and GICNT field exercises related to nuclear forensics.

23. The Netherlands ■ Non-Nuclear-Weapon State

Nuclear Disarmament	**13.5** Points	Full Points **42**	**32.1 %**
	Change compared to the *Hiroshima Report 2018*		**-1.5**

The Netherlands is the only U.S. ally that participated in the negotiation conference of the TPNW, at which it voted against its adoption. The Netherlands has not signed the treaty. Along with other U.S. allies, it advocates the "progressive approach" toward a world without nuclear weapons, through incremental practical measures. It is hosting U.S. non-strategic nuclear weapons as part of NATO's nuclear sharing policy.

Nuclear Non-Proliferation	**55** Points	Full Points **61**	**90.2 %**
	Change compared to the *Hiroshima Report 2018*		**0**

The Netherlands acceded to the IAEA Additional Protocol, and has been applied the integrated safeguards. It has actively engaged in non-proliferation activity, including the establishment of solid export control systems.

Nuclear Security	**32** Points	Full Points **41**	**78.0 %**
	Change compared to the *Hiroshima Report 2018*		**0**

The Netherlands has ratified all nuclear security- and safety-related conventions and has adopted the recommendation measures of INFCIRC/225/Rev.5. The Netherlands is working to minimize the use of HEU and contributes to international efforts such as holding regional workshops of the IAEA.

24. New Zealand ■ Non-Nuclear-Weapon State

Nuclear Disarmament	**32** Points	Full Points **42**	**76.2 %**
	Change compared to the *Hiroshima Report 2018*		**+2**

New Zealand was actively involved in the process of adopting the TPNW, and has already ratified it. It has also proactively advocated promotion of nuclear disarmament at various fora, including the UN General Assembly. It has engaged in promoting the CTBT's entry into force, and developing its verification systems.

Nuclear Non-Proliferation	**57** Points	Full Points **61**	**93.4 %**
	Change compared to the *Hiroshima Report 2018*		**+2**

New Zealand is also a state party to the South Pacific Nuclear-Free Zone Treaty. It has acceded to the IAEA Additional Protocol, and has been applied the integrated safeguards.

Nuclear Security	**28** Points	Full Points **41**	**68.3 %**
	Change compared to the *Hiroshima Report 2018*		**+1**

New Zealand is adopting the recommendation measures of INFCIRC/225/Rev.5, and is actively involved in international efforts such as co-sponsoring the Nuclear Forensics International Technical Working Group (ITWG) meeting.

25. Nigeria ■ Non-Nuclear-Weapon State

Nuclear Disarmament	**22** Points	Full Points **42**	**52.4 %**
	Change compared to the *Hiroshima Report 2018*		**-1.5**
Nigeria voted for most of the UNGA Resolutions regarding nuclear disarmament. It has already signed the TPNW.			
Nuclear Non-Proliferation	**45** Points	Full Points **61**	**73.8 %**
	Change compared to the *Hiroshima Report 2018*		**0**
Nigeria is also a state party to the Africa Nuclear-Weapon-Free Zone Treaty. It acceded to the IAEA Additional Protocol, but has not been drawn the broader conclusion. Its implementations on export controls and nuclear security-related measures are not necessarily adequate.			
Nuclear Security	**30** Points	Full Points **41**	**73.2 %**
	Change compared to the *Hiroshima Report 2018*		**+7**
Nigeria has ratified all nuclear security- and safety-related conventions and has also advanced legislation based on INFCIRC/225/Rev.5. In addition to completing the removal of HEU in the country in 2018, Nigeria is also working on the prevention of illicit trafficking.			

26. Norway ■ Non-Nuclear-Weapon State

Nuclear Disarmament	**14.5** Points	Full Points **42**	**34.5 %**
	Change compared to the *Hiroshima Report 2018*		**-1**
Along with other U.S. allies, Norway advocates the "progressive approach" toward a world without nuclear weapons, through incremental practical measures. It has not signed the TPNW.			
Nuclear Non-Proliferation	**54** Points	Full Points **61**	**88.5 %**
	Change compared to the *Hiroshima Report 2018*		**0**
Norway acceded to the IAEA Additional Protocol, and has been applied the integrated safeguards. It has engaged in non-proliferation, including the establishment of the solid export control systems.			
Nuclear Security	**28** Points	Full Points **41**	**68.3 %**
	Change compared to the *Hiroshima Report 2018*		**0**
Norway has ratified all nuclear security- and safety-related conventions, co-hosted an international symposium on HEU minimization with the IAEA to help prevent illicit trafficking, and is promoting international efforts such as extending a partnership to assist Romania in strengthening its regulatory infrastructure for nuclear safety and security.			

27. The Philippines ■ Non-Nuclear-Weapon State

Nuclear Disarmament	25.5 Points	Full Points 42	60.7 %
	Change compared to the *Hiroshima Report 2018*		-1.5

The Philippines voted for most of the UNGA Resolutions regarding nuclear disarmament. It has already signed the TPNW.

Nuclear Non-Proliferation	52 Points	Full Points 61	85.2 %
	Change compared to the *Hiroshima Report 2018*		+2

The Philippines is also a state party to the Southeast Asia Nuclear-Weapon-Free Zone Treaty. It has concluded the IAEA Additional Protocol, and has been applied integrated safeguards. The Philippines introduced list control and catch-all control in its export control system.

Nuclear Security	28 Points	Full Points 41	68.3 %
	Change compared to the *Hiroshima Report 2018*		0

The Philippines is adopting the recommendation measures of INFCIRC/225/Rev.5, and in 2018 accepted the IAEA's Integrated Nuclear Security Support Plan (INSSP).

28. Poland ■ Non-Nuclear-Weapon State

Nuclear Disarmament	12 Points	Full Points 42	28.6 %
	Change compared to the *Hiroshima Report 2018*		0

Like other NATO countries, Poland maintains a cautious stance on legally banning nuclear weapons. It has not signed the TPNW. Along with other U.S. allies, it advocates the "progressive approach" toward a world without nuclear weapons, through implementing practical measures.

Nuclear Non-Proliferation	52 Points	Full Points 61	85.2 %
	Change compared to the *Hiroshima Report 2018*		0

Poland acceded to the IAEA Additional Protocol, and has been applied the integrated safeguards. It has engaged in non-proliferation, including the establishment of solid export control systems.

Nuclear Security	30 Points	Full Points 41	73.2 %
	Change compared to the *Hiroshima Report 2018*		0

Poland has ratified all nuclear security- and safety-related conventions, adopted the recommendation measures of INFCIRC/225/Rev.5, and is working to prevent illicit trafficking and minimize the use of HEU.

29. Saudi Arabia ■ Non-Nuclear-Weapon State

Nuclear Disarmament	12 Points	Full Points 42	28.6 %
	Change compared to the *Hiroshima Report 2018*		-1

Saudi Arabia voted for most of the UNGA Resolutions regarding nuclear disarmament related to the humanitarian dimensions as well as legal prohibition of nuclear weapons. However, it has not signed the TPNW or the CTBT.

Nuclear Non-Proliferation	36 Points	Full Points 61	59.0 %
	Change compared to the *Hiroshima Report 2018*		0

Saudi Arabia has not acceded to the IAEA Additional Protocol. Its national implementation regarding export controls also came up short. Saudi Arabia plans to introduce nuclear power reactors, but it has repeatedly stated an intention to acquire nuclear weapons should Iran develop them. Saudi Arabia has yet to accept an amended Small Quantity Protocol. It opposes renouncing a right to conduct enrichment and reprocessing activities in negotiations on a Saudi-U.S. civil nuclear cooperation agreement.

Nuclear Security	21 Points	Full Points 41	51.2 %
	Change compared to the *Hiroshima Report 2018*		0

Saudi Arabia has ratified all nuclear security- and safety-related conventions and has also advanced legislation based on INFCIRC/225/Rev.5.

30. South Africa ■ Non-Nuclear-Weapon State

Nuclear Disarmament	25 Points	Full Points 42	59.5 %
	Change compared to the *Hiroshima Report 2018*		-0.5

South Africa has played a leading role for promoting the issue on the humanitarian dimensions of nuclear weapons, as well as adopting the TPNW. It has already signed the treaty.

Nuclear Non-Proliferation	53 Points	Full Points 61	86.9 %
	Change compared to the *Hiroshima Report 2018*		0

South Africa is also a state party to the Africa Nuclear-Weapon-Free Zone Treaty. It acceded to the IAEA Additional Protocol, and has been applied integrated safeguards. It considers that the conclusion of an Additional Protocol should be voluntary.

Nuclear Security	25 Points	Full Points 41	61.0 %
	Change compared to the *Hiroshima Report 2018*		0

Apart from the CPPNM Amendment, South Africa has ratified all nuclear security- and safety-related conventions. In addition to working to prevent illicit trafficking, plans are being made to accept the IAEA's INSSP.

31. Sweden ■ Non-Nuclear-Weapon State

Nuclear Disarmament	**25** Points	Full Points **42**	**59.5 %**
	Change compared to the *Hiroshima Report 2018*		**-1**

Sweden participated in the negotiation conference on the TPNW, at which it voted in favor of adopting the treaty. However, Sweden has not yet signed the TPNW. It has actively advocated promotion of nuclear disarmament. It has engaged in promoting the CTBT's entry into force, and developing its verification systems.

Nuclear Non-Proliferation	**53** Points	Full Points **61**	**86.9 %**
	Change compared to the *Hiroshima Report 2018*		**0**

Sweden acceded to the IAEA Additional Protocol, and has been applied the integrated safeguards. It has engaged in non-proliferation, including the establishment of solid export control systems.

Nuclear Security	**38** Points	Full Points **41**	**92.7 %**
	Change compared to the *Hiroshima Report 2018*		**0**

Sweden has ratified all nuclear security- and safety-related conventions and is also working on the introduction of the recommendation measures of INFCIRC/225/Rev.5 including the development of legal instruments relevant to the nuclear security. Sweden co-hosts nuclear forensics related seminar and is actively involved in international efforts such as capacity building.

32. Switzerland ■ Non-Nuclear-Weapon State

Nuclear Disarmament	**25** Points	Full Points **42**	**59.5 %**
	Change compared to the *Hiroshima Report 2018*		**+0.5**

Switzerland participated in the negotiation conference on the TPNW, at which it voted in favor of adopting the treaty. However, Switzerland published a report, in which it concluded not to sign the TPNW from disarmament diplomacy and security policies point of view. It has actively advocated promotion of nuclear disarmament. It has engaged in promoting the CTBT's entry into force, and developing its verification systems. It has also taken a proactive attitude regarding cooperation with civil society. It enacted national laws, which restrict financing for nuclear weapons production.

Nuclear Non-Proliferation	**50** Points	Full Points **61**	**82.0 %**
	Change compared to the *Hiroshima Report 2018*		**0**

Switzerland acceded to the IAEA Additional Protocol. It was drawn the broader conclusion. It has engaged in non-proliferation, including the establishment of solid export control systems.

Nuclear Security	**32** Points	Full Points **41**	**78.0 %**
	Change compared to the *Hiroshima Report 2018*		**0**

Switzerland has ratified all nuclear security- and safety-related conventions, adopted the recommendation measures of INFCIRC/225/Rev.5, accepted the second IPPAS mission, and contributed to international efforts such as holding the ITWG annual meeting.

33. Syria ■ Non-Nuclear-Weapon State

Nuclear Disarmament	9 Points	Full Points 42	21.4 %
	Change compared to the *Hiroshima Report 2018* +1		

Syria voted for most of the UNGA Resolutions related to the humanitarian dimensions, as well as legal prohibition of nuclear weapons. However, Syria, which has not signed the TPNW or the CTBT, has not actively engaged in promotion of nuclear disarmament.

Nuclear Non-Proliferation	21 Points	Full Points 61	34.4 %
	Change compared to the *Hiroshima Report 2018* 0		

Syria has yet to address and resolve the allegation of constructing a clandestine nuclear power plant, despite repeated requests by the IAEA. Syria has not concluded the IAEA Additional Protocol, and has yet to take appropriate measures on export controls.

Nuclear Security	5 Points	Full Points 41	12.2 %
	Change compared to the *Hiroshima Report 2018* +2		

With the ratification of the Convention on Early Notification of a Nuclear Accident and the Convention on Assistance in the Case of Nuclear Accident or Radiological Emergency in 2018, Syria has advanced its accession to the nuclear security- and safety-related conventions. On the other hand, the introduction of the recommended measures of INFCIR/225/Rev.5 and participation in international efforts are still insufficient.

34. Turkey ■ Non-Nuclear-Weapon State

Nuclear Disarmament	9 Points	Full Points 42	21.4 %
	Change compared to the *Hiroshima Report 2018* +1		

Along with other U.S. allies, Turkey advocates the “progressive approach” toward a world without nuclear weapons, through incremental practical measures. It has not signed the TPNW.

Nuclear Non-Proliferation	50 Points	Full Points 61	82.0 %
	Change compared to the *Hiroshima Report 2018* 0		

Turkey acceded to the IAEA Additional Protocol, and has been applied the integrated safeguards. It has engaged in non-proliferation, including the establishment of solid export control systems.

Nuclear Security	28 Points	Full Points 41	68.3 %
	Change compared to the *Hiroshima Report 2018* 0		

Apart from the Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, Turkey has ratified all nuclear security- and safety-related conventions, and is also working on the introduction of the recommendation measures of INFCIRC/225/Rev.5. In recent years, it has also been working on the minimization of the use of HEU and the prevention of illicit trafficking.

35. The UAE ■ Non-Nuclear-Weapon State

Nuclear Disarmament	**20.5** Points	Full Points **42**	**48.8** %
	Change compared to the *Hiroshima Report 2018*		**-1.5**
The UAE voted for most of the UNGA Resolutions related to the humanitarian dimensions as well as legal prohibition of nuclear weapons. However, it has not yet signed the TPNW.			
Nuclear Non-Proliferation	**45** Points	Full Points **61**	**73.8** %
	Change compared to the *Hiroshima Report 2018*		**0**
The UAE acceded to the IAEA Additional Protocol, but has not been drawn a broader conclusion. On export controls, it established national legislation, which includes a catch-all control, but it is not clear how effectively the UAE has implemented such measures.			
Nuclear Security	**28** Points	Full Points **41**	**68.3** %
	Change compared to the *Hiroshima Report 2018*		**0**
The UAE has ratified all nuclear security- and safety-related conventions, adopted the recommendation measures of INFCIRC/225/Rev.5, and is working on the prevention of illicit trafficking, including participation in the IAEA's Incident and Trafficking Database (ITDB).			

(4) Other

36. North Korea ■ Other

Nuclear Disarmament	**-2** Points	Full Points **98**	**-2.0 %**
	Change compared to the *Hiroshima Report 2018* **+6**		
North Korea turned to a peace offensive in 2018. It convened summit meetings with the United States and South Korea, respectively. While North Korea pledged "denuclearization in the Korean Peninsula," it is unclear whether it has made a strategic decision to renounce its nuclear weapons. North Korea did not conduct nuclear and ballistic missile tests throughout the year, and dynamited the Punggye-ri tunnels. However, it is not clear whether the nuclear test site was irreversibly destroyed. It has not signed the TPNW or the CTBT.			
Nuclear Non-Proliferation	**0** Points	Full Points **61**	**0.0 %**
	Change compared to the *Hiroshima Report 2018* **0**		
North Korea, which declared to withdraw from the NPT in 2003, ignores or reneges on most of the nuclear-related treaties, agreements, obligations and norms. It is reported to actively engage in illicit transfers and procurements of nuclear and missile related items. It was frequently reported that North Korea smuggled refined petroleum beyond the annual upper limit through illicit ship-to-ship transfers.			
Nuclear Security	**-2** Points	Full Points **41**	**-4.9 %**
	Change compared to the *Hiroshima Report 2018* **0**		
In North Korea, no noticeable progress has yet been observed in the areas such as ratification of nuclear security- and safety-related conventions, minimization of HEU and adoption of measures recommended in the INFCIRC/225/Rev.5			

Appendix

Chronology (January-December 2018)

Jan	
Feb	The United States published its NPR
Mar	
Apr	Second Session of the Preparatory Committee of the 2020 NPT Review Conference in Vienna (23th-May 4th) Third Inter-Korean Summit at the Peace House, the Joint Security Area (27th)
May	The United States announced its withdrawal from the JCPOA (8th) UN Secretary-General António Guterres delivered a report, titled *Securing Our Common Future: An Agenda for Disarmament*, at University of Geneva (24th) Fourth Inter-Korean Summit at the Unification Pavilion, the Joint Security Area (26th) First meeting of the Group of Governmental Experts (GGE) to consider the role of verification in advancing nuclear disarmament
Jun	First U.S.-North Korean Summit in Singapore (12th) Meeting of a High-Level FMCT Expert Preparatory Group
Jul	The Japan Atomic Energy Commission revised the "The Basic Principles on Japan's Utilization of Plutonium" (31th)
Aug	Hiroshima Peace Memorial Ceremony (6th) Nagasaki Peace Memorial Ceremony (9th)
Sep	62nd General Conference of the International Atomic Energy Agency in Vienna (17-21th) Fifth Inter-Korean Summit in Pyongyang (18-19th) Ninth Ministerial Meeting of the Friends of the CTBT in New York (27th)
Oct	The United States announced its withdrawal from the INF Treaty (20th)
Nov	
Dec	

Abbreviation

ABACC	Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials
ACA	Arms Control Association
AG	Australia Group
AI	Artificial Intelligence
ALCM	Air-Launched Cruise Missile
AP	Additional Protocol
BMD	Ballistic Missile Defense
CBM	Confidence-Building Measure
CCND	Creating the Conditions for Nuclear Disarmament
CCWG	Creating the Conditions Working Group
CD	Conference on Disarmament
CMX	Comparative Material Exercise
COE	Center of Excellence
CPF	Country Programme Framework
CPPNM	Convention on the Physical Protection of Nuclear Material
CSA	Comprehensive Safeguard Agreement
CTBT	Comprehensive Nuclear-Test-Ban Treaty
CTBTO	CTBT Organization
CVID	Complete, Verifiable, and Irreversible Dismantlement
DBT	Design Basis Threat
DCA	Dual-Capable Aircraft
DPRK	Democratic People's Republic of Korea
E&R	Enrichment and Reprocssing
EC	European Commission
EPR	Emergency Preparedness and Response
EU	European Union
EURATOM	European Atomic Energy Community
FEP	Fuel Enrichment Plant
FFVD	Final, Fully Verified Denuclearization
FMCT	Fissile Material Cut-Off Treaty
FMWG	Fissile Materials Working Group
GBSD	Ground-Based Strategic Deterrent
GCNEP	Global Centre for Nuclear Energy Partnership
GICNT	Global Initiative to Combat Nuclear Terrorism
GLCM	Ground-Launched Cruise Missile
GTRI	Global Threat Reduction Initiative
HEU	Highly Enriched Uranium
IAEA	International Atomic Energy Agency
IAG	Implementation & Assessment Group
ICAN	International Campaign to Abolish Nuclear Weapons

ICBM	Inter-Continental Ballistic Missile
ICJ	International Court of Justice
ICSANT	International Convention for the Suppression of Acts of Nuclear Terrorism
ICTP	International Centre for Theoretical Physics
IMS	International Monitoring System
INF	Intermediate-Range Nuclear Forces
INSEN	International Nuclear Security Education Network
INSServ	International Nuclear Security Advisory Service
INSSP	Integrated Nuclear Security Support Plan
INTERPOL	International Criminal Police Organization
IPFM	International Panel on Fissile Materials
IPNDV	International Partnership for Nuclear Disarmament Verification
IPPAS	International Physical Protection Advisory Service
IRBM	Intermediate-Range Ballistic Missile
ISCN	Integrated Support Center for Nuclear Nonproliferation and Nuclear Security
ITDB	Incident and Trafficking Database
ITWG	Nuclear Forensics International Technical Working Group
IUEC	International Uranium Enrichment Centre
JAEA	Japan Atomic Energy Agency
JCPOA	Joint Comprehensive Plan of Action
KCNA	Korean Central News Agency
LEU	Low Enriched Uranium
LOW	Launch on Warning
LRSO	Long Range Stand-Off Weapon
LUA	Launch under Attack
MFFF	Mixed Oxide Fuel Fabrication Facility
MIRV	Multiple Independently-Targetable Reentry Vehicle
MoU	Memorundum of Understanding
MOX	Mixed Oxide
MTCR	Missile Technology Control Regime
NAC	New Agenda Coalition
NAM	Non-Aligned Movement
NATO	North Atlantic Treaty Organization
NCA	Nuclear Command Authority
NDWG	Nuclear Detection Working Group
NEI	Nuclear Energy Institute
NFU	No First Use
NFWG	Nuclear Forensics Working Group
NGO	Non Govermental Organization
NNSA	National Nuclear Security Administration
NNWS	Non-Nuclear-Weapon States
NPDI	Non-Proliferation and Disarmament Initiative
NPEG	Non-Proliferation Experts Group
NPG	Nuclear Planning Group
NPR	Nuclear Posture Review

NPT	Nuclear Non-Proliferation Treaty
NRSWG	Nuclear & Radiological Security Working Group
NSAs	Negative Security Assurances
NSF	Nuclear Security Fund
NSG	Nuclear Suppliers Group
NSSC	Nuclear Security Training and Support Centres
NSSG	Nuclear Safety and Security Group
NTI	Nuclear Threat Initiative
NWFZ	Nuclear-Weapon-Free Zone
NWS	Nuclear-Weapon States
OFAC	U.S. Department of Treasury's Office of Foreign Assets Control
PMDA	Plutonium Management and Disposition Agreement
POW/MIA	Prisoner of War/Missing in Action
PSI	Proliferation Security Initiative
RI	Radioisotope
RMWG	Response and Mitigation Working Group
RRDB	Research Reactor Database
RRP	Rokkasho Reprocessing Plant
SIPRI	Stockholm International Peace Research Institute
SLA	State-Level Approach
SLBM	Submarine Launched Ballistic Missile
SLC	State-Level Concept
SLCM	Sea-Launched Cruise Missile
SQP	Small Quantity Protocol
SRBM	Short-Range Ballistic Missile
SSAC/RSAC	State System of Accounting for and Control / Regional System of Accounting for and Control of Nuclear Material
SSBN	Nuclear-Powered Ballistic Missile Submarine
SSP	Stockpile Stewardship Program
START	Strategic Arms Reduction Treaty (Talks)
TNPPs	Transportable Nuclear Power Plants
TPNW	Treaty on the Prohibition of Nuclear Weapons
TSOs	Technical and Scientific Support Organizations
UCF	Uranium Conversion Facility
UN	United Nations
UNGA	United Nations General Assembly
UNOCT	United Nations Office of Counter-Terrorism
UNSCRs	UN Security Council Resolutions
UOC	Uranium Ore Concentrate
VOA	Voluntary Offer Agreement
WA	Wassenaar Arrangement
WMD	Weapons of Mass Destruction

Country-by-Country Evaluation

Nuclear Disarmament		Maximum points	Scale of measurement	Nuclear-Weapon States					Non-NPT Parties			Non-Nuclear Weapon States																																Other
				CHN	FRA	RUS	UK	USA	IND	ISR	PAK	AUS	AUT	BEL	BRA	CAN	CHL	EGY	GER	IDN	IRN	JPN	KAZ	ROK	MEX	NED	NZL	NGA	NOR	PHL	POL	SAU	RSA	SWE	SWI	SYR	TUR	UAE	PRK
1	**Status of Nuclear Forces (estimates)**	**-20**																																								
	Status of nuclear forces (estimates)	-20	-5 (～50); -6 (51～100); -8 (101～200); -10 (201～400); -12 (401～1,000); -14 (1,001～2,000); -16 (2,001～4,000); -17 (4,001～6,000); -19 (6,001～8,000); -20 (8,001～) (not applicable to the NNWS)	-10	-10	-19	-10	-19	-8	-6	-8	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	-5
2	**Commitment to Achieving a World without Nuclear Weapons**	**11**																																								
	A) Voting behavior on UNGA resolutions on nuclear disarmament proposals by Japan, NAC and NAM	6	On each resolution: 0 (against); 1 (abstention); 2 (in favor)	2	**1**	0	2	**1**	2	1	3	3	4	2	5	3	**4**	5	2	**6**	5	4	6	2	**5**	**2**	4	5	**2**	6	2	6	4	5	**6**	4	2	6	**3**
	B) Announcement of significant policies and important activities	3	Add 1 point for each policy, proposal and other initiatives having a major impact on the global momentum toward a world without nuclear weapons (maximum 3 points).	0	0	0	0	**1**	0	0	0	0	**1**	0	1	0	**0**	**0**	0	**0**	**0**	1	**0**	**1**	**1**	0	**1**	**0**	0	**0**	0	**0**	**1**	**0**	**0**	0	0	**0**	**1**
	C) Humanitarian consequences of nuclear weapons	2	On each resolution: 0 (against); 0.5（abstention); 1 (in favor)	1	0	0	0	0	1.5	0	1	0.5	2	0.5	2	0.5	2	2	0.5	2	2	1.5	2	0	2	0.5	2	2	0.5	2	0	2	2	1.5	1.5	2	0	2	1
3	**Treaty on the Prohibition of Nuclear Weapons (TPNW)**	**10**																																								
	A) Signing and ratifying the TPNW	7	0 (not signing); 3 (not ratifying); 7 (ratifying)	0	0	0	0	0	0	0	0	0	**7**	0	3	0	3	0	0	3	0	0	**3**	0	**7**	0	**7**	3	0	3	0	0	3	0	0	0	0	0	0
	B) Voting behavior on UNGA resolutions on a legal prohibition of nuclear weapons	3	On each resolution: 0 (against); 0.5 (abstention) ; 1 (in favor)	2	0	0.5	0	0	1.5	0	2	0	2	0	**2.5**	0.5	3	3	0	3	3	1	3	0	3	0	2	3	0	**2.5**	0	3	3	**1.5**	**1.5**	2	0	3	**2**
4	**Reduction of Nuclear Weapons**	**22**																																							
	A) Reduction of nuclear weapons	15	・Add 1～10 points in accordance with the decuple rate of reduction from the previous fiscal year for a country having declared the number of nuclear weapons. ・For a country having not declared it, add some points using the following formula: (the previous target – the latest target)÷ the estimated number of nuclear weapons×10. ・Add 1 (engaging in nuclear weapons reduction over the past 5 years); add 1 (engaging in nuclear weapons reduction under legally-binding frameworks such as New Strategic Arms Reduction Treaty); add 1 (announcing further reduction plan and implementing it in 2018) ・Give a perfect score (15 points) in case of the total abolition of nuclear weapons. (not applicable to the NNWS)	0	**0**	**2.2**	1	**2.5**	0	0	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0
	B) A concrete plan for further reduction of nuclear weapons	3	0 (no announcement on a plan of nuclear weapons reduction); 1 (declaring a rough plan of nuclear weapons reduction); 2 (declaring a plan on the size of nuclear weapons reduction); 3 (declaring a concrete and detailed plan of reduction) (not applicable to the NNWS)	0	0	0	0	0	0	0	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0

Nuclear Disarmament		Maximum points	Scale of measurement	Nuclear-Weapon States					Non-NPT Parties			Non-Nuclear Weapon States																														Other
				CHN	FRA	RUS	UK	USA	IND	ISR	PAK	AUS	AUT	BEL	BRA	CAN	CHL	EGY	GER	IDN	IRN	JPN	KAZ	ROK	MEX	NED	NZL	NGA	NOR	PHL	POL	SAU	RSA	SWE	SWI	SYR	TUR	UAE	PRK
	C) Trends on strengthening/modernizing nuclear weapons capabilities	4	0 (modernizing/reinforcing nuclear forces in a backward move toward nuclear weapons reduction); 2～3 (modernizing/reinforcing nuclear forces which may not lead to increasing the number of nuclear weapons); 4 (not engaging in nuclear modernization/reinforcement)	**0**	3	**0**	3	**2**	**0**	**2**	**0**	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0
			(not applicable to the NNWS)																																					
5	**Diminishing the Role and Significance of Nuclear Weapons in National Security Strategies and Policies**	**8**																																						
	A) The current status of the roles and significance of nuclear weapons	-8	-7～-8 (judged based on the declaratory policy)	-7	-7	-7	-7	-7	-7	-7	-7	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	-7
			(not applicable to the NNWS)																																					
	B) Commitment to “sole purpose,” no first use, and related doctrines	3	0 (not adopting either policy); 2 (adopting a similar policy or expressing its will to adopt either policy in the future); 3 (already adopting either policy)	3	0	0	0	0	2	0	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0
			(not applicable to the NNWS)																																					
	C) Negative security assurances	2	0 (not declaring); 1 (declaring with reservations); 2 (declaring without reservations)	2	1	1	1	1	2	0	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1
			(not applicable to the NNWS)																																					
	D) Signing and ratifying the protocols of the treaties on nuclear-weapon-free zones	3	Add 0.5 point for the ratification of one protocol; a country ratifying all protocols marks 3 points	2	2	2	2	0.5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
			(not applicable to countries expect NWS)																																					
	E) Relying on extended nuclear deterrence	-5	(not applicable to the NWS and Non-NPT Parties)	–	–	–	–	–	–	–	–	-3	0	-5	0	-3	0	0	-5	0	0	-3	0	-3	0	-5	0	0	-3	0	-3	0	0	0	0	0	-5	0	–
			(applied solely to the NNWS): -5 (a country relying on the nuclear umbrella and participating in nuclear sharing); -3 (a country relying on the nuclear umbrella); 0 (a country not relying on the nuclear umbrella)																																					
6	**De-alerting or Measures for Maximizing Decision Time to Authorize the Use of Nuclear Weapons**	**4**																																						
	De-alerting or measures for maximizing decision time to authorize the use of nuclear weapons	4	0～1 (maintaining a high alert level); 2 (maintaining a certain alert level); 3 (de-alerting during peacetime); add 1 point for implementing measures for increasing the credibility of (lowered) alert status	3	2	1	2	1	3	2	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3
			(not applicable to the NNWS)																																					
7	**CTBT**	**11**																																						
	A) Signing and ratifying the CTBT	4	0 (not signing); 2 (not ratifying); 4 (ratifying)	2	4	4	4	2	0	2	0	4	4	4	4	4	4	2	4	4	2	4	4	4	4	4	4	4	4	4	4	0	4	4	4	0	4	4	0
	B) Moratoria on nuclear test explosions pending CTBT’s entry into force	3	0 (not declaring); 2 (declaring); 3 (declaring and closing the nuclear test sites)	2	3	2	2	2	2	0	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	**2**
			(not applicable to the NNWS)																																					

	Nuclear Disarmament	Maximum points	Scale of measurement	Nuclear-Weapon States					Non-NPT Parties			Non-Nuclear Weapon States																												Other
				CHN	FRA	RUS	UK	USA	IND	ISR	PAK	AUS	AUT	BEL	BRA	CAN	CHL	EGY	GER	IDN	IRN	JPN	KAZ	ROK	MEX	NED	NZL	NGA	NOR	PHL	POL	SAU	RSA	SWE	SWI	SYR	TUR	UAE	PRK
	C) Cooperation with the CTBTO Preparatory Commission	2	0 (no cooperation or no information); 1～2 (paying contributions, actively participating in meetings, and actively engaging in the outreach activities for the Treaty's entry into force)	1	2	2	2	2	0	1	0	2	2	2	1	2	**0**	1	2	1	0	2	2	2	1	2	2	0	2	2	2	0	1	2	2	0	2	2	0
	D) Contribution to the development of the CTBT verification systems	2	Add 1 point for establishing and operating the IMS; add another 1 point for participating in the discussions on enhancing the CTBT verification capabilities	1	2	2	2	2	0	2	0	2	2	2	2	2	1	0	2	2	0	2	2	2	2	2	2	1	2	1	2	0	2	2	2	0	2	0	0
	E) Nuclear testing	-3	-3 (conducting nuclear test explosions in the past 5 years);-1 (conducting nuclear tests without explosion or the status is unclear); 0 (not conducting any nuclear tests) (not applicable to the NNWS)	-1	-1	-1	-1	-1	-1	-1	-1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	-3
8	**FMCT**	**10**																																					
	A) Commitment, efforts, and proposals toward immediate commencement of negotiations on an FMCT	5	Add 1 (expressing a commitment); add 1～2 (actively engaging in the promotion of early commencement); add 1～2 (making concrete proposals on the start of negotiations)	1	**3**	1	3	3	1	1	1	3	3	3	3	4	2	1	3	1	1	**3**	1	3	1	3	3	2	3	2	2	1	3	3	3	0	1	1	0
	B) Moratoria on the production of fissile material for use in nuclear weapons	3	0 (not declaring); 1 (not declaring but not producing fissile material for nuclear weapons); 2 (declaring); 3 (declaring and taking measures for the cessation of the production as declared) (not applicable to the NNWS)	1	2	3	2	2	0	0	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0
	C) Contribution to the development of verification measures	2	0 (no contribution or no information); 1 (proposing a research on verification measures); 2 (engaging in R&D for verification measures)	0	1	0	1	1	0	0	0	1	1	1	0	1	0	0	1	0	0	1	0	1	0	1	1	0	1	0	0	0	0	1	0	0	0	0	0
9	**Transparency in Nuclear Forces, Fissile Material for Nuclear Weapons, and Nuclear Strategy/Doctrine**	**6**																																					
	Transparency in nuclear forces, fissile material for nuclear weapons, and nuclear strategy/doctrine	6	Add 1～2 (disclosing the nuclear strategy/doctrine); add 1～2 (disclosing the status of nuclear forces); add 1～2 (disclosing the status of fissile material usable for nuclear weapons) (not applicable to the NNWS)	1	3	2	4	5	1	0	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0
10	**Verifications of Nuclear Weapons Reductions**	**7**																																					
	A) Acceptance and implementation of verification for nuclear weapons reduction	3	0 (not accepting or implementing); 2 (limited acceptance and implementation); 3 (accepting and implementing verification with comprehensiveness and completeness); deduct 1～2 points in case of non-compliance or problems in implementation (not applicable to the NNWS)	0	0	3	0	3	0	0	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0
	B) Engagement in research and development for verification measures of nuclear weapons reduction	1	0 (not engaging or no information); 1 (engaging in R&D)	0	1	0	1	1	0	0	0	1	0	1	1	1	1	0	1	1	0	1	1	1	1	1	0	0	1	1	1	0	0	1	1	0	1	1	0

	Nuclear Disarmament	Maximum points	Scale of measurement	Nuclear-Weapon States					Non-NPT Parties			Non-Nuclear Weapon States																																Other
				CHN	FRA	RUS	UK	USA	IND	ISR	PAK	AUS	AUT	BEL	BRA	CAN	CHL	EGY	GER	IDN	IRN	JPN	KAZ	ROK	MEX	NED	NZL	NGA	NOR	PHL	POL	SAU	RSA	SWE	SWI	SYR	TUR	UAE	PRK
	C) The IAEA inspections to fissile material declared as no longer required for military purposes	3	0 (not implementing), 1(limited implementation); 3 (implementing); add 1 point if a country engages in the efforts for implementing or strengthening the implementation, except in the case of already implementing (not applicable to the NNWS)	0	1	0	3	1	0	0	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0
11	**Irreversibility**	**7**																																								
	A) Implementing or planning dismantlement of nuclear warheads and their delivery vehicles	3	0 (not implementing or no information); 1 (perhaps implementing but not clear); 2～3 (implementing) (not applicable to the NNWS)	0	2	2	2	3	0	0	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0
	B) Decommissioning/conversion of nuclear weapons-related facilities	2	0 (not implementing or no information); 1 (implementing in a limited way); 2 (implementing extensively) (not applicable to the NNWS)	0	1	1	1	1	0	0	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0
	C) Measures for fissile material declared excess for military purposes, such as disposition or conversion to peaceful purposes	2	0 (not implementing or no information); 1 (implementing in a limited way); 2 (implementing); 3 (implementing extensively) (not applicable to the NNWS)	0	1	2	1	2	0	0	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0
12	**Disarmament and Non-Proliferation Education and Cooperation with Civil Society**	**4**																																							
	Disarmament and non-proliferation education and cooperation with civil society	4	Add 1 (participating in the joint statement or mentioning at the NPT PrepCom/ Revcon, etc); add 1～2 (implementing disarmament and non-proliferation education); add 1～2 (cooperating with civil society) Maximum 4 points	**1**	2	1	3	3	1	**0**	0	3	4	2	1	3	**1**	**1**	3	1	0	4	1	1	**1**	**2**	**3**	**1**	1	1	1	0	1	3	**3**	0	1	1	0
13	**Hiroshima and Nagasaki Peace Memorial Ceremonies**	**1**																																							
	Hiroshima and Nagasaki Peace Memorial Ceremonies	1	0 (not attending)；0.5 (not attending in 2018 but has attended at least once during the past 3 years)；1 (attending any one of the ceremonies)	**1**	1	1	1	1	1	1	1	1	1	1	1	1	**1**	1	**1**	1	1	1	1	1	**1**	**1**	1	**1**	1	1	1	0	**1**	**1**	**1**	**1**	**1**	**0.5**	0
	Points			**8**	**20**	**5.7**	**25**	**16**	**2**	**-2**	**0**	**17.5**	**33**	**13.5**	**26.5**	**19**	**22**	**16**	**14.5**	**25**	**14**	**22.5**	**26**	**15**	**29**	**13.5**	**32**	**22**	**14.5**	**25.5**	**12**	**12**	**25**	**25**	**25**	**9**	**9**	**20.5**	**-2**
	Full Points			**101**	**101**	**101**	**101**	**101**	**98**	**98**	**98**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**98**
	(%)			**7.9**	**19.8**	**5.6**	**24.8**	**15.8**	**2.0**	**-2.0**	**0.0**	**41.7**	**78.6**	**32.1**	**63.1**	**45.2**	**52.4**	**38.1**	**34.5**	**59.5**	**33.3**	**53.6**	**61.9**	**35.7**	**69.0**	**32.1**	**76.2**	**52.4**	**34.5**	**60.7**	**28.6**	**28.6**	**59.5**	**59.5**	**59.5**	**21.4**	**21.4**	**48.8**	**-2.0**
2018 Edition	**Points**			**10**	**23**	**7.8**	**25**	**16.7**	**4**	**0**	**2**	**17.5**	**30**	**13.5**	**27**	**19**	**26.5**	**18**	**14**	**25**	**15**	**23.5**	**24**	**14**	**27.5**	**15**	**30**	**23.5**	**15.5**	**27**	**12**	**13**	**25.5**	**26**	**24.5**	**8**	**8**	**22**	**-8**
	Full Points			**101**	**101**	**101**	**101**	**101**	**98**	**98**	**98**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**98**
	(%)			**9.9**	**22.8**	**7.7**	**24.8**	**16.5**	**4.1**	**0.0**	**2.0**	**41.7**	**71.4**	**32.1**	**64.3**	**45.2**	**63.1**	**42.9**	**33.3**	**59.5**	**35.7**	**56.0**	**57.1**	**33.3**	**65.5**	**35.7**	**71.4**	**56.0**	**36.9**	**64.3**	**28.6**	**31.0**	**60.7**	**61.9**	**58.3**	**19.0**	**19.0**	**52.4**	**-8.2**

Numbers in blue cells improved compared to the *Hiroshima Report 2018*. Numbers in pink cells worsened compared to the *Hiroshima Report 2018*.

	Nuclear Non-Proliferation	Maximum points	Scale of measurement	Nuclear-Weapon States					Non-NPT Parties			Non-Nuclear Weapon States																																	Other
				CHN	FRA	RUS	UK	USA	IND	ISR	PAK	AUS	AUT	BEL	BRA	CAN	CHL	EGY	GER	IDN	IRN	JPN	KAZ	ROK	MEX	NED	NZL	NGA	NOR	PHL	POL	SAU	RSA	SWE	SWI	SYR	TUR	UAE	PRK
1	**Acceptance and Compliance with Nuclear Non-Proliferation Obligations**	**20**																																									
	A) Accession to the NPT	10	0 (not signing or declaring withdrawal); 3 (not ratifying); 10 (in force)	10	10	10	10	10	0	0	0	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	0
	B) Compliance with Articles I and II of the NPT and the UNSC resolutions on non-proliferation	7	0 (non-complying with Article I and II of the NPT); 3～4 (having not yet violated Article I and II of the NPT but displaying behaviors that raise concerns about proliferation, or not complying with the UNSC resolutions adopted for relevant nuclear issues); 5 (taking concrete measures for solving the non-compliance issue); 7 (complying) As for the non-NPT states (maximum 3 points); 2 (not complying with the UNSC resolutions adopted for relevant nuclear issues); 3 (other cases)	7	7	7	7	7	2	3	2	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	4	7	7	0
	C) Nuclear-Weapon-Free Zones	3	1 (signing the NWFZ treaty); 3 (ratifying the treaty)	–	–	–	–	–	0	0	0	3	0	0	3	0	3	1	0	3	0	0	3	0	3	0	3	3	0	3	0	0	3	0	0	0	0	0	0
2	**IAEA Safeguards Applied to the NPT NNWS**	**18**																																									
	A) Signing and ratifying a Comprehensive Safeguards Agreement	4	0 (not signing); 1 (not ratifying); 4 (in force)	–	–	–	–	–	–	–	–	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0
	B) Signing and ratifying an Additional Protocol	5	0 (not signing); 1 (not ratifying); 3 (provisional application); 5 (in force)	–	–	–	–	–	–	–	–	5	5	5	0	5	5	0	5	5	3	5	5	5	5	5	5	5	5	5	5	0	5	5	5	0	5	5	0
	C) Implementation of the integrated safeguards	4	0 (not implementing); 2 (broader conclusion) 4 (implementing)	–	–	–	–	–	–	–	–	4	4	4	0	4	4	0	4	4	0	4	**4**	4	0	4	**4**	0	4	**4**	4	0	4	4	2	0	2	0	0
	D) Compliance with IAEA Safeguards Agreement	5	0 (not resolving the non-compliance issue); 2 (taking concrete measures for solving the non-compliance issue); 5 (complying)	–	–	–	–	–	–	–	–	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	0	5	5	0
3	**IAEA Safeguards Applied to NWS and Non-Parties to the NPT**	**7**																																								
	A) Application of the IAEA safeguards (Voluntary Offer Agreement or INFCIRC/66) to their peaceful nuclear in facilities	3	0 (not applying); 2 (applying INFCIRC/66); 3 (applying Voluntary Offer Agreement)	3	3	3	3	3	2	2	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	B) Signing, ratifying, and implementing the Additional Protocol	4	0 (not signing); 1 (not ratifying); 3 (in force); add 1 point if widely applied to peaceful nuclear activities	3	3	3	3	4	3	0	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
4	**Cooperation with the IAEA**	**4**																																								
	Cooperation with the IAEA	4	Add 1 (contributing to the development of verification technologies); add 1～2 (contributing to the universalization of the Additional Protocol); add 1 (other efforts)	1	3	2	3	3	0	0	0	3	2	3	1	3	1	0	3	1	0	3	0	3	1	3	2	1	2	1	1	0	1	2	2	0	1	1	0

	Nuclear Non-Proliferation	Maximum points	Scale of measurement	Nuclear-Weapon States					Non-NPT Parties			Non-Nuclear Weapon States																																Other
				CHN	FRA	RUS	UK	USA	IND	ISR	PAK	AUS	AUT	BEL	BRA	CAN	CHL	EGY	GER	IDN	IRN	JPN	KAZ	ROK	MEX	NED	NZL	NGA	NOR	PHL	POL	SAU	RSA	SWE	SWI	SYR	TUR	UAE	PRK
5	**Implementing Appropriate Export Controls on Nuclear-Related Items and Technologies**	**15**																																								
	A) Establishment and implementation of the national control systems	5	0 (not establishing); 1 (establishing but insufficient); 2 (establishing a system to a certain degree); 3 (establishing an advanced system, including the Catch-all); add 1～2 (if continuing to implement appropriate export controls); deduct 1～2 (not adequately implementing)	3	5	4	5	5	4	5	2	5	5	5	5	5	2	2	5	1	0	5	5	5	5	5	5	1	5	3	5	1	5	5	5	0	5	3	0
	B) Requiring the conclusion of the Additional Protocol for nuclear export	2	0 (not requiring or no information); 1 (requiring for some cases); 2 (requiring)	0	0	0	0	1	0	0	0	1	1	0	0	1	1	0	1	0	0	1	0	0	1	1	1	1	1	1	1	0	0	1	0	0	1	1	0
	C) Implementation of the UNSCRs concerning North Korean and Iranian nuclear issues	3	0 (not implementing or no information); 2 (implementing); 3(actively implementing); deduct 1～3 (depending on the degree of violation)	1	3	1	3	3	2	2	2	3	3	3	2	3	2	2	3	2	2	3	2	3	3	3	3	2	3	2	2	2	3	3	3	0	2	2	0
	D) Participation in the PSI	2	0 (not participating); 1 (participating); 2 (actively participating)	0	2	2	2	2	0	1	0	2	0	2	0	2	2	0	2	0	0	2	1	2	0	2	2	0	2	1	2	1	0	1	1	0	2	1	0
	E) Civil nuclear cooperation with non-parties to the NPT	3	0 (exploring active cooperation); 1~2 (contemplating cooperation, subject to implementing additional nuclear disarmament and non-proliferation measures); 3 (showing a cautious attitude or being against it)	0	0	0	1	0	—	—	—	1	3	3	3	0	3	3	3	3	3	1	0	0	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	0
6	**Transparency in the Peaceful Use of Nuclear Energy**	**4**																																							
	A) Reporting on the peaceful nuclear activities	2	0 (not reporting or no information); 1 (reporting but insufficiently); 2 (reporting)	2	2	2	2	2	2	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	0	2	2	0
	B) Reporting on plutonium management	2	0 (not reporting or no information); 1 (reporting); 2 (reporting on not only plutonium but also uranium); add 1 (ensuring a high level of transparency in plutonium although not being obliged to report)	**0**	**0**	1	0	**0**	0	0	0	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0
	Points			**30**	**38**	**35**	**39**	**40**	**15**	**13**	**10**	**56**	**52**	**54**	**43**	**52**	**52**	**37**	**56**	**48**	**37**	**53**	**49**	**51**	**50**	**55**	**57**	**45**	**54**	**52**	**52**	**36**	**53**	**53**	**50**	**21**	**50**	**45**	**0**
	Full Points			**47**	**47**	**47**	**47**	**47**	**43**	**43**	**43**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**
	(%)			**63.8**	**80.9**	**74.5**	**83.0**	**85.1**	**34.9**	**30.2**	**23.3**	**91.8**	**85.2**	**88.5**	**70.5**	**85.2**	**85.2**	**60.7**	**91.8**	**78.7**	**60.7**	**86.9**	**80.3**	**83.6**	**82.0**	**90.2**	**93.4**	**73.8**	**88.5**	**85.2**	**85.2**	**59.0**	**86.9**	**86.9**	**82.0**	**34.4**	**82.0**	**73.8**	**0.0**
2018 Edition	**Points**			**31**	**40**	**35**	**39**	**41**	**15**	**13**	**10**	**56**	**52**	**54**	**43**	**52**	**52**	**37**	**56**	**48**	**37**	**53**	**47**	**51**	**50**	**55**	**55**	**45**	**54**	**50**	**52**	**36**	**53**	**53**	**50**	**21**	**50**	**45**	**0**
	Full Points			**47**	**47**	**47**	**47**	**47**	**43**	**43**	**43**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**
	(%)			**66.0**	**85.1**	**74.5**	**83.0**	**87.2**	**34.9**	**30.2**	**23.3**	**91.8**	**85.2**	**88.5**	**70.5**	**85.2**	**85.2**	**60.7**	**91.8**	**78.7**	**60.7**	**86.9**	**77.0**	**83.6**	**82.0**	**90.2**	**90.2**	**73.8**	**88.5**	**82.0**	**85.2**	**59.0**	**86.9**	**86.9**	**82.0**	**34.4**	**82.0**	**73.8**	**0.0**

Numbers in blue cells improved compared to the *Hiroshima Report 2018*. Numbers in pink cells worsened compared to the *Hiroshima Report 2018.*

Nuclear Security		Maximum points	Scale of measurement	Nuclear-Weapon States					Non-NPT Parties			Non-Nuclear Weapon States																													Other
				CHN	FRA	RUS	UK	USA	IND	ISR	PAK	AUS	AUT	BEL	BRA	CAN	CHL	EGY	GER	IDN	IRN	JPN	KAZ	ROK	MEX	NED	NZL	NGA	NOR	PHL	POL	SAU	RSA	SWE	SWI	SYR	TUR	UAE	PRK
1	**The Amount of Fissile Material Usable for Weapons**	**-16**																																					
	The amount of fissile material usable for weapons	-16	Firstly, -3 (if possessing fissile material usable for nuclear weapons). Then, deduct if: ・HEU: -5 (>100t); -4 (>20t); -3 (>10t); -2 (>1t); -1 (possessing less than 1t) ・Weapon-grade Pu: -5 (>100t); -4 (>20t); -3 (>10t); -2 (>1t); -1 (possessing less than 1t) ・Reactor-grade Pu: -3 (>10t); -2 (>1t); -1 (possessing less than 1t)	**-9**	-12	-16	-12	**-14**	-8	-5	-6	-4	0	-5	0	-5	0	0	**-5**	0	-4	-8	-6	0	0	-4	0	**0**	-4	0	0	0	-4	0	-4	-4	0	0	-5
2	**Status of Accession to Nuclear Security and Safety-Related Conventions, Participation in Nuclear Security Related Initiatives, and Application to Domestic Systems**	**21**																																					
	A) Convention on the Physical Protection of Nuclear Material and the 2005 Amendment to the Convention	3	0 (not signing the Treaty); 1 (not ratifying the Treaty); 2 (Treaty in force, not ratifying the Amendment); 3 (both the Treaty and Amendment in force)	3	3	3	3	3	3	3	3	3	3	3	2	3	3	1	3	3	0	3	3	3	3	3	3	3	3	2	3	3	2	3	3	0	3	3	0
	B) International Convention for the Suppression of Acts of Nuclear Terrorism	2	0 (not signing); 1 (not ratifying); 2 (in force)	2	2	2	2	2	2	1	0	2	2	2	2	2	2	1	2	2	0	2	2	2	2	2	2	2	2	1	2	2	2	2	2	1	2	2	0
	C) Convention on Nuclear Safety	2	0 (not signing); 1 (not ratifying); 2 (in force)	2	2	2	2	2	2	1	2	2	2	2	2	2	2	1	2	2	0	2	2	2	2	2	0	2	2	1	2	2	2	2	2	2	2	2	0
	D) Convention on Early Notification of a Nuclear Accident	2	0 (not signing); 1 (not ratifying); 2 (in force)	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	**2**	2	2	1
	E) Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management	2	0 (not signing); 1 (not ratifying); 2 (in force)	2	2	2	2	2	0	0	0	2	2	2	2	2	2	0	2	2	0	2	2	2	**2**	2	0	2	2	1	2	2	2	2	2	0	0	2	0
	F) Convention on Assistance in Case of a Nuclear Accident or Radiological Emergency	2	0 (not signing); 1 (not ratifying); 2 (in force)	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	**2**	2	2	1
	G) INFCIRC/225/Rev.5	4	0 (not applying or no information); 2 (applying to the national implementation system); 4 (applying and implementing adequately)	2	2	2	2	2	2	2	2	2	0	2	2	2	2	0	2	2	2	2	2	2	2	2	2	2	0	2	2	2	2	2	2	0	2	2	0

Nuclear Security		Maximum points	Scale of measurement	Nuclear-Weapon States					Non-NPT Parties			Non-Nuclear Weapon States																													Other
				CHN	FRA	RUS	UK	USA	IND	ISR	PAK	AUS	AUT	BEL	BRA	CAN	CHL	EGY	GER	IDN	IRN	JPN	KAZ	ROK	MEX	NED	NZL	NGA	NOR	PHL	POL	SAU	RSA	SWE	SWI	SYR	TUR	UAE	PRK
	H) Enactment of laws and establishment of regulations for the national implementation	4	0 (not establishing domestic laws and regulations and the national implementation system); 1～2 (establishing them but insufficiently); 4 (establishing appropriately)	4	4	4	4	4	4	4	4	4	4	4	4	4	3	2	4	4	3	4	4	4	4	4	4	4	2	3	3	2	4	4	4	2	4	2	1
3	**Efforts to Maintain and Improve the Highest Level of Nuclear Security**	**20**																																					
	A) Minimization of HEU and Plutonium stockpile in civilian use	4	0 (no effort or no information); 1 (limited efforts); 3 (active efforts); add 1 (committed to further enhancement)	4	4	4	3	4	4	4	0	4	4	4	4	4	3	0	3	4	0	3	4	4	4	4	3	**4**	4	3	4	0	4	4	4	0	3	4	0
	B) Prevention of illicit trafficking	5	0 (not implementing or no information); 2 (limited implementation); 4 (active implementation); add 1 (committed to further enhancement)	4	4	4	4	5	5	4	5	4	4	4	4	5	4	2	4	4	2	4	**4**	4	4	2	2	**4**	4	5	4	2	4	4	4	0	2	4	0
	C) Acceptance of international nuclear security review missions	2	0 (not accepting or no information); 1 (accepting); 2 (actively accepting)	2	2	0	2	2	0	0	0	2	0	0	0	2	2	2	1	2	2	2	2	1	2	2	2	2	2	2	1	0	0	2	2	0	2	1	0
	D) Technology development —nuclear forensics	2	0 (not implementing or no information); 1 (implementing); 2 (actively implementing)	1	2	2	2	2	0	2	1	2	0	1	0	2	1	0	1	0	0	2	0	2	**1**	2	**1**	0	1	0	0	0	1	2	2	0	2	0	0
	E) Capacity building and support activities	2	0 (not implementing or no information); 1 (implementing); 2 (actively implementing)	**2**	2	1	2	2	**2**	0	**2**	1	1	0	1	1	1	1	2	**2**	0	2	1	2	0	2	0	0	1	1	0	1	1	2	1	0	0	0	0
	F) IAEA Nuclear Security Plan and Nuclear Security Fund	2	0 (no effort or information); 1 (participating); 2 (actively participating)	2	2	2	2	2	2	1	1	1	1	2	0	2	0	0	2	0	1	2	1	2	0	2	2	0	2	0	0	0	0	2	1	0	1	1	0
	G) Participation in international efforts	3	0 (not participating); 1 (participating in a few frameworks); 2 (participating in many or all frameworks); add 1 (if contributing actively)	2	3	3	3	3	1	1	1	3	1	3	1	3	1	0	3	0	0	3	3	3	3	3	3	1	3	3	3	1	1	3	3	0	1	1	0
	Points			**27**	**26**	**19**	**25**	**25**	**23**	**22**	**19**	**32**	**28**	**28**	**28**	**33**	**30**	**14**	**30**	**31**	**10**	**29**	**28**	**37**	**33**	**32**	**28**	**30**	**28**	**28**	**30**	**21**	**25**	**38**	**32**	**5**	**28**	**28**	**-2**
	Full Poins			**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**
	(%)			**65.9**	**63.4**	**46.3**	**61.0**	**61.0**	**56.1**	**53.7**	**46.3**	**78.0**	**68.3**	**68.3**	**68.3**	**80.5**	**73.2**	**34.1**	**73.2**	**75.6**	**24.4**	**70.7**	**68.3**	**90.2**	**80.5**	**78.0**	**68.3**	**73.2**	**68.3**	**68.3**	**73.2**	**51.2**	**61.0**	**92.7**	**78.0**	**12.2**	**68.3**	**68.3**	**-4.9**
2018 Edition	**Points**			**25**	**26**	**19**	**25**	**24**	**22**	**22**	**18**	**32**	**28**	**28**	**28**	**33**	**30**	**14**	**28**	**30**	**10**	**29**	**26**	**37**	**30**	**32**	**27**	**23**	**28**	**28**	**30**	**21**	**25**	**38**	**32**	**3**	**28**	**28**	**-2**
	Full Points			**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**
	(%)			**61.0**	**63.4**	**46.3**	**61.0**	**58.5**	**53.7**	**53.7**	**43.9**	**78.0**	**68.3**	**68.3**	**68.3**	**80.5**	**73.2**	**34.1**	**68.3**	**73.2**	**24.4**	**70.7**	**63.4**	**90.2**	**73.2**	**78.0**	**65.9**	**56.1**	**68.3**	**68.3**	**73.2**	**51.2**	**61.0**	**92.7**	**78.0**	**7.3**	**68.3**	**68.3**	**-4.9**

Numbers in blue cells improved compared to the *Hiroshima Report 2018*. Numbers in pink cells worsened compared to the *Hiroshima Report 2018*.

Nothing threatens global security more than the accidental or deliberate detonation of a nuclear weapon. Those who rely on nuclear weapons for deterrence or who produce and store weapons grade material have a special responsibility. In bringing accountability to those countries' support for disarmament, non-proliferation and improved nuclear security, Hiroshima, with their unique voice, are providing a valuable service to all of humanity for which we owe a debt of gratitude.

Desmond Henry Browne

The Rt Hon. the Lord Browne of Ladyton
Former U.K. Defense Secretary, Vice Chair of the Nuclear Threat Initiative

As in its previous editions, the Hiroshima Report appears as a reliable compass systematically compiling information and facts, all of them indispensable tools for practical action. The Report inspires my work as we move closer to the 2020 Review Conference of the Non-Proliferation Treaty.

Rafael Mariano Grossi

Ambassador of Argentina to Austria and International Organizations in Vienna
President-designate
2020 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT)

The name Hiroshima reminds us why progress in nuclear disarmament, non-proliferation and reducing nuclear risks must be at the top of the global security agenda. This latest Hiroshima Report is an excellent analysis of the challenges ahead. It should serve as an urgent call for policymakers and governments to take actions to reduce and ultimately eliminate the threat nuclear weapons pose to mankind and to God's universe.

Sam Nunn

Former U.S. Senator, Co-Chair of the Nuclear Threat Initiative

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ISBN978-4-9910140-7-9