



Contemporary Opportunities for the NPT

Perspectives from the Emerging Voices Network

Edited by Laura Rose Brown and Emily Enright

The British American Security Information Council (BASIC)

The Foundry, 17 Oval Way, London SE11 5RR

Charity Registration No. 1001081

T: +44 (0) 20 77663465 www.basicint.org © The British American Security Information Council (BASIC), 2021

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The Emerging Voices Network

Launched in December 2020, the Emerging Voices Network (EVN) is a digital network of high-potential, next-generation leaders on nuclear issues who will inherit the responsibility to manage nuclear threats. In founding the EVN, BASIC's aim was to create a truly inclusive digital space wherein younger voices from marginalised communities around the world are heard on nuclear issues. The Network promotes collaboration, dialogue and bridge-building between next-generation leaders from the Global North and South, with diversity and inclusivity at the forefront of the Network's ethos and mission.

BASIC

BASIC is a London-based think tank that promotes meaningful dialogue amongst governments and experts in order to build international trust, reduce nuclear risks, and advance disarmament. We have a global reputation for convening distinctive and empathic dialogues that help states overcome complex strategic and political differences. Our established networks and expertise, developed since 1987, enable us to get the right people in the room and facilitate effective, meaningful exchange between siloed and often hostile political communities.

Acknowledgements

The publication of this collection has been made possible through the generous support of Global Affairs Canada (GAC), which shares our vision for an equitable, inclusive and diverse nuclear policy community. We extend our particular thanks to Alyssa Mellon, Specialist in Nuclear Non-Proliferation, Arms Control and Disarmament, and Kevin Hamilton. Director General of International Security Policy at GAC. We also thank the Norwegian Ministry of Foreign Affairs for their generous contribution to this project in particular, and to inclusivity and diversity in nuclear more broadly. Next, we are grateful to the United Nations Office for Disarmament Affairs (UNODA), particularly Chris King, Deputy Secretary-General of the Tenth NPT Review Conference, for championing the EVN's pilot policy cycle, and for contributing to the success of the March EVN Plenary.

Each paper in this anthology is the result of the dedication of each member of the EVN, under the leadership of their respective Working Group Chairs - our sincere thanks to each of them. The EVN membership is equally to be commended for its hard work and dedication throughout this project, and for its commitment to generating discussion and innovation in nuclear policy.

Foreword

We are at the beginning of what some observers describe as the third nuclear age, defined by increasing great power tensions, a widening group of nuclear-armed states and new technologies that will impact nuclear weapons policies, particularly strategic non-nuclear weapons, cyber capabilities and artificial intelligence. These developments have probably already increased the risk of nuclear war and may do so further if measures are not taken to address dangerous trends and new nuclear risks. In January of this year, the *Bulletin of the Atomic Scientists* moved its symbolic Doomsday Clock to 100 seconds to midnight, reflecting the view that the risk of nuclear war is greater now than at any time since the development of nuclear weapons. We urgently need new and creative thinking on nuclear weapons.

The Emerging Voices Network (EVN) responds directly to this need. A global, digital community developed by and for young professionals, the EVN brings together a new generation of experts, policy professionals and researchers who share a common passion for managing and addressing the risks posed by nuclear weapons. The EVN provides an open and inclusive framework for dialogue and policy development on all nuclear weapons issues, with the aim of supporting the development of this younger generation of experts as leaders and changemakers while producing innovative ideas and fresh perspectives on intractable challenges.

A critical feature of the EVN is its diversity. Addressing the most pressing challenges in global nuclear policy requires the cooperation of states and other actors with different, even conflicting perspectives and worldviews, as well as the management of complex international relationships. So far, the EVN has brought together 135 members from almost 40 countries, including all regions of the world. In convening this global network of future leaders with a wide array of cultural and professional backgrounds, the EVN is facilitating the formation of lasting professional relationships characterised by empathy, collaboration, and a shared mission to manage nuclear threats. This group of young people are poised to work together throughout their careers to address shared challenges and implement innovative solutions to nuclear policy's thorniest problems.

The first iteration of the EVN's work, culminating in the publication of this anthology, was funded by Global Affairs Canada, to whom we are grateful for their support and vision. BASIC is very proud to support and be involved with the important work of the EVN, and is excited for the future of this project.

Prof. Andrew Cottey Chair, British American Security Information Council (BASIC)

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The Papers

This collection of policy papers is the culmination of several months' dedicated work by members of the Emerging Voices Network (EVN). In December of 2020, the EVN's seven working groups were tasked with articulating a specific set of policy challenges within their area of expertise, and developing an innovative, ambitious and implementable agenda for resolving them.

In just three short months, the EVN members delivered on that brief. The quality and insightfulness of these papers is a credit not just to their authors, but to all emerging voices in nuclear policy, highlighting the value and talent of young people as systems-level thinkers and critical analysts of pressing security challenges. Furthermore, this collection offers a bold vision for collaboration and trust-building as the foundations of a more equitable, responsible future for global nuclear policy, and testifies that the passion, wisdom and energy of the next generation of leaders in policy will support progress towards sustainable peace and security.

The recommendations within this work were presented to senior leaders in the nuclear policy field on 31st March 2021, during the landmark Plenary of the EVN. This event, developed in collaboration with the United Nations Office for Disarmament Affairs, brought together over 200 participants from around the world to celebrate and critically engage with youth perspectives on nuclear policy.

The Working Groups

The Non-Proliferation Treaty

Working Group Co-Chairs: Noah Mayhew, Joseph Rodgers

This paper examines the Non-Proliferation Treaty as an institution, and in particular discusses opportunities for success at the Tenth NPT Review Conference. It highlights the vital role of political will and institutional cooperation in creating positive atmospherics and tangible policy progress, and its key recommendations target metrics for success alongside broader strategies for strengthening the treaty's regime.

Disruptive Technology

Working Group Co-Chairs: Elisabeth (Betty) Suh, Alexa W

This paper examines the impact of Machine Learning (ML) on nuclear early warning systems. Highlighting the opportunities and risks associated with Deep Learning systems, the paper includes recommendations for improved technological literacy of policymakers, greater international transparency and confidence-building measures (CBMs).

Peaceful Uses, Nuclear Safety and Security

Working Group Chair: Rafael Chesori

This paper explores isotope hydrology as a tool for increasing access to clean water and sanitation, framed within the context of the United Nations' Sustainable Development Goals. Its recommendations target improving education on isotope hydrology amongst the technical and policy communities as a critical first step.

Non-Proliferation

Working Group Chair: Natalia Zhurina

Special thanks to: Jessica Budlong, Julia Masterson

The final paper explores the lessons learned from multilateral non-proliferation work focussed Iran and North Korea. It highlights the importance of regional partnerships, extant agreements and SMART goals developing durable, flexible non-proliferation agreements and regimes.

Diversity and Inclusion

Working Group Co-Chairs: Jana Wattenberg, Gustavo Pereira

This paper examines the challenges to increasing diversity and inclusivity within the nuclear policy field. The paper illustrates young leaders' capacity to positively impact nuclear policymaking, and recommends strategies for increasing youth engagement in policy leadership, particularly in the Global South.

Arms Control

Working Group Co-Chairs: Carlos Rodriguez-Cruz Y Celis, Zuzanna Gwadera

This paper presents an ambitious arms control agenda for 2050. It emphasises the ongoing importance of the US-Russia-China dynamic in the global policy landscape, particularly in light of emerging technologies' impact on security. Its recommendations target improved verification collaboration and future asymmetric arms control measures.

Disarmament

Working Group Co-Chairs: Marzhan Nurzhan, María Garzón Maceda

This investigates how the newly in-force Treaty on the Prohibition of Nuclear Weapons (TPNW) might interact with the Non-Proliferation Treaty (NPT). It provides recommendations for non-nuclear NATO states in particular, suggesting they act as 'bridge-builders' in the increasingly complex and politically contested international environment.

Next Steps

This paper collection will form the foundations of the EVN's side-event and other activities at the Tenth NPT Review Conference. The EVN membership is keenly aware of the criticality of the NPT, and is determined to contribute to a positive outcome at the Review Conference for States Parties and civil society alike particularly in light of the Conference's postponement. The EVN will commence a new policy cycle following the Tenth NPT Review Conference, and will build on work to date to develop fresh thinking on key policy challenges facing nuclear institutions. The coming policy cycle will focus particularly on ensuring that those institutions, underpinning critical work in arms control, non-proliferation, disarmament and peaceful uses of nuclear technology, remain fit-for-purpose, and that the youth of today will be equipped to lead those institutions with courage and resolve.



Recommendations for Success in the NPT Review Process

The Non-Proliferation Treaty Working Group

Authors: Thomas Brown, Abdul Byamukama, Eleonara Colzani, Naomi Egel, Jarret Fisher, Noah Mayhew, Marion Messmer, Joseph Rodgers, Rose Tenyotkina, Galina Salnikova, Dina Saadallah, Daria Selezneva, Alice Spilman and Lena Strauss

A. Introduction

The delayed Tenth NPT Review Conference faces a wide range of challenges. As nuclear-weapon States (NWS) pursue nuclear modernisation, an increasing number of non-nuclear-weapon States (NNWS) have voiced support for the Treaty on the Prohibition of Nuclear Weapons (TPNW). International withdrawal from arms control agreements has exacerbated progress on disarmament. Meanwhile, the Middle East Zone Free of Weapons of Mass Destruction (MEWMDFZ) held its first conference in 2019, revealing regional fault lines between participating States. Additionally, the long quest for the universalisation of the NPT has yet to be realized. In the midst of these challenges and a global pandemic, an increasing number of NPT analysts are questioning whether the 2020 Review Conference can successfully forge a consensus final document.

The EVN NPT Working Group (hereafter "the Working Group") identified three areas of recommendations for the NPT: (1) critical conditions for success in the NPT context; (2) alternatives to consensus final documents as metrics for success; and (3) other factors that may affect the review process.

B. Conditions for Success in the NPT Review Process

B.1. Political Will

The NPT has, on balance, been an overwhelming success. Nuclear arsenals are a fifth the size they were 50 years ago and, contrary to US President Kennedy's fears that "15 or 20 or 25 nations may have these [nuclear] weapons" by the 1970s, today only nine countries command nuclear arsenals. However, this success should not be taken for granted. Success in arms control and success in the NPT review process are closely intertwined. The importance of arms control must be recognised in order to create the conditions possible for a successful Tenth Review Conference.

NPT States Parties have played a pivotal role in bolstering political will for broader arms control efforts. Political will has been necessary for the success of the NPT and the establishment of individual arms control agreements. For example, at the 2010 NPT Review Conference, the delegation of Ireland, the New Agenda Coalition and others encouraged Presidents Obama and Medvedev to make progress towards disarmament through the negotiations that led to the New Strategic Arms Reduction Treaty (New START). This pressure helped bolster the political will around arms control and the New START discussions, and directly contributed to a successful Review Conference.

B.2. Multi-Level, Institutional Cooperation

Strong, multi-level institutional cooperation is critical to success in the NPT review process, including but not limited to the International Atomic Energy Agency (IAEA), export control regimes, UN agencies with a peace and security focus, national governments, the scientific community, militaries, academia and civil society. Cooperation between NWS, NNWS, and nuclear-weapon-possessor states outside the NPT has also proven beneficial to the NPT regime.

The IAEA, as the NPT's de facto verification body, applies comprehensive safeguards in NNWS, and separately provides guidance on nuclear security. However, strengthened safeguards and nuclear security have become divisive due to the perception that these measures prevent NNWS from accessing nuclear technologies for peaceful purposes, especially in the Global South. Many developing countries also fear that increased allocations to safeguards and security in the IAEA's budget will reduce available funding for the Agency's technical cooperation activities. Cooperation between all stakeholders at all levels to dispel this "us versus them" perception will be critical for a successful outcome at the Review Conference.

Civil society organisations have the expertise, technical and research capabilities, and time to engage with the public in unique ways and facilitate bridge-building between NWS and NNWS. However, availability of funding for civil society organisations focused on non-proliferation and disarmament is limited, a situation likely to worsen in the coming years due in large part to the COVID-19 pandemic. Ensuring broad participation, including by civil society, in official non-proliferation discourse, will be critical to the future success of the NPT review process.

B.3. Fear of Nuclear War

Another condition that has made success possible in this realm is the fear of nuclear war itself. The atomic bombings of Hiroshima and Nagasaki in 1945 have shown the destructive capability of these weapons. The Cuban Missile Crisis in 1962 showed the nuclear powers that they too were vulnerable – that a nuclear explosion does not respect national borders. It was in large part fear of the catastrophic consequences of nuclear use that drove the United States and the Soviet Union to enter into arms control agreements, and to push for the establishment of the NPT, together with the United Kingdom.

The Working Group believes that the 21st century has seen a marked decrease in the priority placed on arms control and non-proliferation, driven in part by the decreasing salience of nuclear weapons public discourse. The political will to insulate nuclear issues from other disagreements has disappeared, arms control is in a

fragile state, multilateralism is in crisis and international institutions are subject to political tensions unrelated to the substance of their work. At the core of these trends is complacency. It is the tacit belief of many that a nuclear war could never really happen, that nuclear deterrence could never fail, and rising antipathy towards multilateralism. This makes political will difficult to generate and opens important international institutions to collateral damage.

B.4. Recommendations

The Working Group:

- [°] Encourages the P₅, in particular the United States and the Russian Federation, to return to regular, constructive dialogue on arms control, including to conclude a follow-on treaty to New START.
- [°] Urges NPT States Parties to depoliticise discourse in multilateral institutions, focusing instead on strengthening their impact.
- Recommends NPT States Parties to establish national funds to provide opportunities for young researchers to work on non-proliferation issues and for members of civil society to participate in NPT meetings, including but not limited to the Review Conferences.
- [°] Suggests enhanced efforts on non-proliferation education in the general public to raise awareness about the risks posed by nuclear weapons and the need to mitigate those risks through diplomacy.

C. Alternatives to the Consensus Final Document

C.1. The Limitations of Consensus Final Documents as a Metric for Success

Consensus final documents are widely viewed as the NPT review process' metric of success. To date, NPT Review Conferences have achieved a consensus final document in 1975, 1985, 2000, and 2010. Consensus final documents have often proposed grandiose goals. The 2000 Consensus Final Document proposed 13 "practical steps" and the 2010 consensus final document proposed a 64-point action plan that set goals across the three pillars of the NPT. The Working Group finds reliance on a consensus final document as a metric of success or failure of a Review Conference to be a barrier to success in the NPT review process.

Outcome documents regularly contain vague and infeasible undertakings with little detail about how the goals will be implemented or progress measured. As a result, there is often little correlation between the production of consensus final documents and the implementation of concrete actions.

NPT Review Conference agreements are not self-implementing. Individual States Parties must fulfil their own commitments independently, and there is no legal mechanism that holds States Parties accountable. This lack of accountability has created a cycle of making grand promises that are not fulfilled.

Consensus documents inherently take an all-or-nothing approach whereby all States Parties must agree to one document or risk the failure of the entire Review Conference. Additionally, they can be very challenging to implement, resulting in watered down recommendations and an incomplete view of both individual and collective progress. More emphasis is placed on reaching consensus than on making actual progress on the three pillars, which can diminish the value of different streams of work pushing towards the same goal. When consensus fails, a review cycle may inappropriately be labelled a failure, despite positive dialogue and tangible progress on certain issues, contributing to the perception of crisis in the regime.

C.2. Alternatives for a Consensus Final Document at the Tenth Review Conference

A consensus final document from the Tenth Review Conference seems unlikely. In the short term, the delayed Review Conference should consider alternative measures of success. Critically, NPT States Parties should emphasise the need to recommit to previous, unfulfilled commitments, including under the 13

practical steps identified in 2000 and the 64-point action plan agreed in 2010 by States Parties, which span all three pillars of the NPT.

Further strengthening of IAEA safeguards, guaranteed access to peaceful uses of nuclear energy, and entry into force of the CTBT illustrate the broad scope of commitments that still require substantial progress. The delay in the Tenth Review Conference presents an opportunity to recommit to previous obligations before seeking to create more.

Recent Review Conferences have been characterised by strong divisions between NWS, NWS allies, and certain NNWS. As such, it is imperative that the delegations to the Tenth Review Conference aim to build cohesion through the constructive and sustained engagement of all relevant stakeholders. To further this process, NWS should implement concrete measures to allay the concerns of the NNWS. One such step could include issuing negative security assurances through ratification of relevant protocols to nuclearweapon-free zone treaties. The recent extension of New START by the United States and the Russian Federation is another important step in this regard.

C.3. Recommendations

The Working Group:

- Suggests that State Parties develop substantive working groups to consider alternative outcomes to the consensus final document, including: (1) smaller, separate, forward-looking documents that contain recommendations agreed upon by consensus in order to ease the consensus process; (2) a final report which details text that was agreed by consensus and text that was not, also including progress to date based on previous outcome documents; (3) binding documents agreed to by coalitions of States; (4) outcome documents that list a menu of options States Parties can voluntarily take to advance the three pillars.
- [°] Urges State Parties to set concrete, feasible goals with measurable deliverables rather than vague political commitments in order to improve accountability in the NPT review process.
- Recommends that States Parties recommit to previous goals set forth in consensus final documents. In the spirit of avoiding an all-or-nothing approach, States Parties might opt to select a handful of the most pressing commitments to focus their attention on in the first instance. The Stockholm Initiative's Stepping Stones Approach might be a useful framework for prioritising these commitments.
- Considers a joint P5 statement on pragmatic steps to ensure the future health and vitality of the NPT regime to be a helpful measure to ease tensions between NWS and NNWS. This might include a follow-on from the statement published on 10 March 2020 that identifies realistic steps the P5 can take during the next review cycle to enhance strategic stability. These measures should include frank P5 dialogue on nuclear modernisation and its impact on arms control.
- Recommends States Parties consider use of the "gift basket" diplomacy model that was utilised at the Nuclear Security Summits. Gift basket diplomacy seeks to create collective action within smaller groups of countries rather than seeking to achieve consensus. This approach could allow NWS and NNWS to demonstrate concrete progress on implementation of the NPT on a unilateral or "minilateral" basis. The P5 glossary is one such attempt.

D. Strengthening the Capacity of the Non-Proliferation Regime

D.1. IAEA Safeguards

The nuclear safeguards implemented by the IAEA are a crucial bulwark for ensuring peaceful nuclear technology is not diverted for weapons development, as well as a guarantor of access to peaceful uses of

nuclear energy. For safeguards to function as intended, the IAEA requires a reliable resource flow, especially as it concerns its core budget, but also for extrabudgetary funding.

The IAEA has operated for much of its history on a zero-real-growth budget, meaning that the core budget increases from year to year only to account for inflation. At the same time, the number of facilities and locations outside facilities required to be safeguarded per NPT's Article III is increasing. In 2019, the IAEA's Regular Budget decreased in real terms. This negative budgetary trend will impact the IAEA's ability to deliver concrete results for the benefit of Member States.

D.2. Export Controls

Export controls comprise a crucial element of the global nuclear non-proliferation regime. The increasing impact of dual-use, new, and emerging technologies creates new challenges for non-proliferation. In particular, as new technologies contribute to the peaceful use of nuclear energy it is critically important to judiciously control deemed exports, or the tacit knowledge behind a technology. As the role of emerging technologies increases, the nexus between the success of the NPT and export control regimes will become increasingly intertwined.

D.3. New and Emerging Trends

A wide range of new and emerging technologies pose a direct threat to all three pillars of the NPT. For instance, additive manufacturing techniques could make detecting and catching proliferation much more challenging. The incorporation of new weapons technologies, such as hypersonic glide vehicles and enhanced precision capabilities, are contributing to the rise of a new arms race. The development of alternative green energy sources has cast the future of nuclear energy in limbo.

While it remains unclear how these trends will unfold, it is critically important that all NPT States Parties continue to fulfil their obligations under the NPT while developing new technologies. For technologically advanced States, this means technology sharing, building transparency and confidence building measures into NPT-relevant technological developments, and pursuing good faith negotiations on effective measures relating to the cessation of the nuclear arms race.

D.4. Recommendations

The Working Group:

- Recommends that States Parties support the IAEA by increasing the core budget in real terms commensurate with increasing need, and by assisting in the pursuit of new and diverse funding sources. As budget increases are considered, extended safety measures to ensure continuity of work throughout the pandemic should be included.
- Maintains that a multi-stakeholder approach is critical to utilise new and emerging technology to enhance all aspects of the non-proliferation regime, as well as to mitigate the potential threats they pose. Ideally, a group of experts consisting of members from academia, industry, consulting, and governments should provide the most current research and "tailor-made" policy recommendations to all parties.

Conclusion

The Working Group praises the work being done under the auspices of the NPT review process and by the IAEA, the Wassenaar arrangement, the Nuclear Suppliers Group, and others in the global non-proliferation regime. The Working Group asserts that re-prioritising multilateralism, reconsideration of consensus final documents as the sole metric of success in the NPT review process, and strengthening capacity within the non-proliferation regime as a whole would contribute powerfully to counteracting the negative trends that threaten prospects for success at the Tenth NPT Review Conference.



Preemptive Discussions: the Potential Implications of Integrating Deep Learning into Early Warning Systems

The Disruptive Technology Working Group

Authors: Alisha Anand, Liza Arias, Belen Bianco, Fabian Hoffmann, Artur Honich, Natasha Karner, Niels Renssen, Elisabeth Suh, Lydia Wachs, Alexa W

Abstract

Early warning systems (EWS) are a critical part of the global nuclear command, control, and communications (NC3) enterprise. As nations begin to modernise these systems, discussion of further integration of artificial intelligence (AI) and machine learning (ML) approaches into various aspects of NC3 systems has publicly (and presumably privately) emerged via international expert communities. AI and ML are concepts that have become 'buzz words' but are often discussed without reference to the exact meaning and context in which they could be applied. This paper seeks to explore the areas in which EWS could be subject to the integration of novel machine learning (ML) techniques, particularly deep learning (DL) – an integration which is presumably already occurring in the intelligence, surveillance, and reconnaissance (ISR) spheres of the nuclear realm. In doing so, the authors hope to both raise awareness of

this ML technique given its rise in popularity across various sectors, as well as provide an example of the way in which novel technologies could be discussed in the nuclear context. In order to assess the consequences of such integration, it is necessary for stakeholders to both understand the technology and discuss its significance in open fora. Although knowledge is limited and security concerns remain, such discussions are vital to encouraging transparency and risk reduction as well as mitigating negative implications. The following analysis offers actionable processes for stakeholders regarding the potential opportunities and risks associated with the potential integration of DL into EWS in order to mitigate risks and increase crisis stability.

Defining Nuclear Early Warning Systems and Deep Learning

EWS provide states with both an awareness of incoming missiles and the ability to respond. These are essential building blocks for first strike survivability, second strike capability, and strategic stability to various degrees in all nuclear possessor states. Furthermore, EWS are also important for those states that benefit from (extended) nuclear deterrence, including those that possess or contribute components.

Modern EWS consist of a network of satellites and ground and air-based radars. In the pre-launch phase, these components allow states to engage in ISR missions, such as monitoring international nuclear force readiness. In the boost phase, infrared sensors on the satellites detect heat signatures released during missile launch, track missiles during early flight stages and communicate trajectories to their respective command centers. Ground and air-based radar systems track missiles in later flight stages during the midcourse and terminal phases of flight.³² For states without advanced satellite constellations, radars may be the only viable detection mechanism within their EWS. Information from EWS systems can also be used for operations with preemptive or preventive purposes.

Broadly, EWS have implemented AI and ML processes, to various extents, for decades. An increase in the commercial application of DL approaches paired with aging legacy systems, advancements in delivery systems, increases in dual-capability and various global calls for nuclear modernisation, could incentivise states to consider integrating DL into EWS modernisation attempts.³³

ML (in broad terms) consists of a computer finding ideal parameters of an unknown function. DL is an approach to ML composed of logical structures of algorithms, with at least one 'hidden layer', modeled after the biological brain, called artificial neural networks.

"Deep learning uses networks that contain layers of nodes that in some ways mimic the neurons in the brain. Each layer of neurons takes the data from the layer below it, performs a calculation, and provides its output to the layer above it."³⁴

³² Kingston Reif, "Missile Defense Systems At a Glance," Arms Control Association Fact Sheets & Briefs, accessed 29 March 2021, https://www.armscontrol.org/factsheets/missiledefenseataglance#q2.

³³ See, for example: Page O. Stoutland, "Artificial Intelligence and the modernization of U.S. nuclear forces," in *The Impact of Artificial Intelligence on Strategic Stability and Nuclear Risk* Volume 1 Euro-Atlantic Perspectives ed. By Vincent Boulain (SIPRI, May 2019), 63-67, https://sipri.org/publications/2020/other-publications/impact artificial-intelligence-strategic-stability-and-nuclear-risk-volume-iii-south-asian; Lora Saalman, "China's Artificial Intelligence-Enabled Offense: Hypersonic Glide Vehicles and Neural Networks," in *Artificial Intelligence, China, Russia, and the Global Order: Technological, Political, Global, and Creative Perspectives* ed. by Nicholas D. Wright (Alabama: Air University Press, 2019), 162-168, https://bit.ly/3sBkQb3.

³⁴ Ben Buchanan and Taylor Miller, *Machine Learning for Policymakers: What It Is and Why It Matters* (Cambridge, MA: Belfer Center for Science and International Affairs, 2017), 14-15, https://www.belfercenter.org/sites/default/ files/ files/publication/MachineLearningforPolicymakers.pdf.

Ongoing DL research primarily aims to further improve its input-efficiency, precision, and speed as well as algorithms' ability to process unknown information or unpredictability in data.³⁵ For these reasons, among others, plausible integration of DL into the pre-launch and launch phase of EWS would most likely occur within extremely specific areas with specific tasking, such as components that address image and audio recognition and processing.

Opportunities for DL- Enhanced EWS

The net effects of technological developments and their application are not predetermined, nor static across time and space. Novel technologies can prove more or less disruptive depending upon the context in which they are introduced and the ways in which humans interact with them. Given the advantages of DL in efficiently processing and fusing large amounts of data and self-improving its own accuracy over time, careful integration into EWS can mitigate the risk of accidental or inadvertent escalation due to false positives (i.e. detection of non-existent pre-launch/boost activities), enhance strategic stability by reducing the likelihood of false negatives (i.e. non-detection of actual pre-launch/boost activities),³⁶ and afford decision-makers more time to consider necessary and proportionate courses of action in the case of true positives (i.e. detection of actual pre-launch/boost activities).³⁷

The integration of DL into EWS creates significant opportunities during the pre-launch phase and the boost phase. In the pre-launch phase, the integration of DL into EWS could allow for an increase in accuracy for computer vision, particularly with regard to aspects of EWS that are tasked with image classification, pattern recognition and anomaly detection. It could enhance ISR capabilities, thereby facilitating awareness of the existence, nature, and imminence of threats before they materialise (i.e., before missiles are launched). During the boost phase, integration of DL could improve the overall performance of EWS by progressively enhancing accuracy, speed, and data processing capacity.³⁸ DL-enhanced EWS could provide human decision-makers with more time to both decide upon and execute a range of countermeasures, such as 1) pre-emption, 2) crisis diplomacy, and 3) target protection.

First, the integration of DL could improve so-called 'left-of-launch' capabilities such as "persistent overhead coverage and all-weather ISR; and rapid processing, exploitation, and dissemination of targeting information."³⁹

Second, the implementation of DL into EWS could allow for an increased output specificity based on the specific environment in which it is applied.⁴⁰ In addition, DL approaches can provide increased efficiency and

- 37 Michal Onderco and Madeline Zutt, "Will Humans and/or Machines Save Us From Nuclear Doomsday?," *Clingendael Spectator*, January 6, 2021, https://spectator.clingendael.org/en/publication/will-humans-andor machines-save-us-nuclear-doomsday.
- 38 Edward Geist and Andrew J. Lohn, *How Might Artificial Intelligence Affect the Risk of Nuclear War*? (Santa Monica, California: RAND Corporation, 2018), 10, https://www.rand.org/pubs/perspectives/PE296.html.
- 39 *2019 Missile Defense Review* (Washington DC: Office of the Secretary of Defense, January 2019), 33, https:// media. defense.gov/2019/Jan/17/2002080666/-1/-1/1/2019-MISSILE-DEFENSE-REVIEW.pdf.
- 40 The term 'output' is contingent on the environment in which the DL technique is applied. One could imagine outcomes for DL application within EWS ranging from decision-making options, to specific vulnerability identification to increased image classification options.

³⁵ Additionally, increasing advances in quantum computing "could enable a quantum approach to deep learning neural networks for greatly enhanced AI and data analytics"; see: NATO Science & Technology Organization, *Science & Technology Trends 2020-2040 Exploring the S&T Edge*, (Brussels: NATO, Report March 2020), 23.

³⁶ Lora Saalman, "Fear of False Negatives: Al and China's Nuclear Posture," Bulletin of the Atomic Scientists, April 24, 2018, https://thebulletin.org/2018/04/fear-of-false-negatives-ai-and-chinas-nuclear-posture/. Thomas C. Schelling and Morton H. Halperin, Strategy and Arms Control (New York: Twentieth Century Fund, 1961), 50.

speed of complex data processing, which could in turn provide more outputs for human decision-makers as well as the potential for increased decision-making timelines. Further, DL approaches, when applied to various pre-launch and boost phase environments, could decrease the risk of potential miscalculations or technical misperceptions, and, in doing so, could aid crisis diplomacy and the peaceful resolutions of various situations.⁴¹

Third, DL-enhanced early warning during the pre-launch phase widens the timeframe within which measures can be adopted to protect counterforce or counter-value targets, such as civilian populations and infrastructure. Given the time-sensitive nature of such measures (e.g., evacuation or missile interception), their effectiveness and efficiency could be significantly enhanced through DL-enabled anticipation of attacks.⁴² DL-enhanced early warning during the boost phase could widen the timeframes for measures of active defense, such as missile defense response and interception, or timely attribution and reciprocal retaliation.

Risks for Nuclear Stability

Despite these opportunities, incorporating DL into EWS could have destabilising effects and exacerbate nuclear risks, stemming from 1) technical shortcomings, and 2) human-machine interactions.

First, the effectiveness of DL integration largely depends on both the quantity and quality of available data, in order to accurately make connections and identify patterns.⁴³ As operational datasets for events like nuclear attack are non-existent, the system would need to draw from artificially constructed datasets and testing scenarios.⁴⁴ As such, challenges could arise when trying to match the training data to the deployed environment and ensuring representativeness of the data.⁴⁵

Further, DL systems are vulnerable to data poisoning, wherein biased data is fed unintentionally into the training model, which could result in the machine producing biased outputs when 'triggered' by the attacker – possibly pushing human operators towards a certain interpretation or decision. In addition, attacks utilizing adversarial examples⁴⁶ – "an instance with small, intentional feature perturbations that cause a machine learning model to make a false prediction",⁴⁷ can exploit a DL system by coaxing it toward a certain output via intentionally injecting it with imperceptibly corrupted input.⁴⁸ This could be particularly concerning in a nuclear EWS context as one could imagine the possibility of a compromised DL system prompting the boost phase due to data poisoning or an adversarial example attack. Because adversarial examples do not

- 47 Christoph Molnar, Interpretable machine learning. A Guide for Making Black Box Models Explainable, Chapter 6.2, last updated 28 July 2021, https://christophm.github.io/interpretable-ml-book/adversarial.html.
- 48 Erin D. Dumbacher and Page O. Stoutland, "U.S. Nuclear Weapons Modernization: Security and Policy Implications of Integrating Digital Technology," (Washington DC: NTI, November 2020), 25, https://media.nti.org/ documents/ NTI_Modernization2020_FNL-web.pdf.

⁴¹ Phil Stewart, "Deep in the Pentagon, a Secret Al Program to Find Hidden Nuclear Missiles," *Reuters*, June 5, 2018, https://www.reuters.com/article/us-usa-pentagon-missiles-ai-insight-idUSKCN1J114J.

Vincent Boulanin, ed., *The Impact of Artificial Intelligence on Strategic Stability and Nuclear Risk* (Stockholm: SIPRI, 2019), 23, 28, 34, 41-49, 53-54, 65-66, 69-70, 80, 83, 86, 91, 136-137, https://www.sipri.org/publications/ 2019/ other-publications/impact-artificial-intelligence-strategic-stability-and-nuclear-risk-volume-i-euro-atlantic.

⁴³ Eda Kavlakoglu, Al vs. Machine Learning vs. Deep Learning vs. Neural Networks: What's the Difference? *IBM Blog*, May 27, 2020, https://www.ibm.com/cloud/blog/ai-vs-machine-learning-vs-deep-learning-vs-neural-networks

⁴⁴ Boulanin, The Impact of Artificial Intelligence on Strategic Stability and Nuclear Risk, 19.

⁴⁵ iPRAW, Focus on Computational Methods in the Context of LAWS, 2017, https://www.ipraw.org/publications/ computational-methods/, 11-12.

⁴⁶ Louise Matsakis, "Artificial Intelligence May Not 'Hallucinate' After All," *wired*, August 5, 2019, https:// www.wired. com/story/adversarial-examples-ai-may-not-hallucinate/

necessarily need access to the DL system's training data or parameters and are highly imperceptible, these attacks are incredibly challenging to defend against.⁴⁹ Adversarial attacks writ large are not necessarily always intentional, particularly when large amounts of data are not available — they can be a result of lack of a robust learning model due to underspecification.⁵⁰ Accidental robustness issues would be equally, if not more, concerning than intentional data poisoning or intentional adversarial attacks, especially in the context of nuclear EWS.

Further, the complex nature of such systems engenders the possibility of accidental use. Hidden interactions (such as feedback loops) may be unforeseen by human operators, whilst tightly coupled (i.e. interdependent) connections mean there is no "buffer" time between different internal EWS interactions.⁵¹ As such, accidents can be inevitable or "normal" in complex technological systems.⁵² Given the function of EWS, a single error or system failure could quickly trigger a devastating sequence of events toward accidental nuclear use.

Second, increased risk of accidental or inadvertent escalation can also stem from human behaviour, including the interaction between the system and a human operator. Specifically, complications could arise when attempting to understand why the system reacted (or failed to react) to certain real-life stimuli.⁵³ 'Un-interpretability' of DL systems may compromise trust in the system's reasoning – a serious problem given the dire consequences of false positives (false alarms) and false negatives (no alarms) in the nuclear context.⁵⁴ In an effort to counteract possible un-interpretability, predictability and understandability are necessary safety requirements to ensure the system is functioning correctly and thus must be worked into the testing, evaluation, validation and verification (TEVV) regime.⁵⁵ A lack of transparency over how and why certain correlations or conclusions are reached would compromise both assurances in the system, and its ability to trigger a fail-safe. Moreover, human "over-trust or uncritical trust" of machine capabilities (automation bias) may be heightened in crisis situations with the often-quoted requirement to "fight at machine speed."⁵⁶ Taken together, opacity of a system and automation bias could undermine effective human oversight which is of critical importance in the nuclear realm.

- 49 Paul Scharre, "Killer Apps: The Real Dangers of an Al Arms Race," *Foreign Affairs*, May/June 2021, https:// www. foreignaffairs.com/articles/2019-04-16/killer-apps.
- 50 Alexander D'Amour et al. "Underspecification Presents Challenges for Credibility in Modern Machine Learning" *arXiv* (November, 2020) https://arxiv.org/abs/2011.03395
- 51 UNIDIR, Safety, Unintentional Risk and Accidents in the Weaponization of Increasingly Autonomous Technologies, (Geneva: UNIDIR, 2016), 6, https://unidir.org/files/publications/pdfs/safety-unintentional-risk-and accidents-en-668. pdf.
- 52 Leveson, Nancy, Nicolas Dulac, Karen Marais, and John Carroll, "Moving Beyond Normal Accidents and High Reliability Organizations: A Systems Approach to Safety in Complex Systems," *Organization Studies* 30, no. 2–3 (2009), https://doi.org/10.1177/0170840608101478.
- 53 Michael C. Horowitz and Paul Scharre, *Al and International Stability: Risks and Confidence Building Measures* (Washington DC: CNAS, 2021), 7, https://s3.us-east-1.amazonaws.com/files.cnas.org/documents/Al-and International-Stability-Risks-and-Confidence-Building-Measures.pdf.
- 54 Arthur Holland Michel, The Black Box, Unlocked: Predictability and Understandability in Military AI (Geneva: UNIDIR, 2020), https://unidir.org/publication/black-box-unlocked; Michael C. Horowitz, Paul Scharre and Alexander Velez-Green, "A Stable Nuclear Future? The Impact of Autonomous Systems and Artificial Intelligence," arXiv (December 2019), 4, https://arxiv.org/abs/1912.05291.
- 55 Holland Michel, The Black Box, Unlocked.
- 56 Margarita Konaev, Tina Huang and Husdanjot Chahal, "Trusted Partners: Human-Machine Teaming and the Future of Military AI," *CSET Issue Brief* (February 2021), 17, https://cset.georgetown.edu/wp-content/uploads/ CSET-Trusted-Partners.pdf; Horowitz, Scharre and Velez-Green, *A Stable Nuclear Future*?, 1.

Furthermore, significant enhancements of ISR capabilities kindle target states' perceptions of insecurity and vulnerability. By enabling the precise location, tracking, and targeting of second-strike capabilities, in particular mobile ICBMs, DL-enhancements in EWS could decrease deliberate ambiguity and undermine target states' first strike survivability, second strike capabilities, and thereby effective strategic deterrents.⁵⁷ This could have immediate effects on escalation spirals in crises. As likely consequences, target states could be incentivised to expand their nuclear forces and quickly advance their own AI enabled capabilities, potentially implementing immature technologies.⁵⁸

In sum, the possible integration of DL in EWS could carry significant destabilising implications for crisis stability. In both cases, the mere perception of an adversary's capabilities often matters more than the actual capabilities themselves. To make things worse, false alarms—due to technical errors, inadequate data, or adversarial perturbations—paired with opaque algorithms and the human proclivity for automation bias, could cause crisis instability by setting off a proactive reaction that leads to accidental or inadvertent escalation.⁵⁹ The potentially devastating consequences would be particularly acute with nuclear weapons on high alert status.

Conclusion

It is imperative to create a context which could facilitate the potential integration of DL into aspects of EWS in a manner which enables optimal harnessing of the opportunities DL presents as well as mitigation of the risks it may create. Thus, states ought to be selective about when and where to integrate which technologies, must invest in technological literacy for decision-makers, allow for independent oversight, exchange best practices, be transparent about their approaches, and negotiate norms and confidence-building measures. The following section proposes measures that could contribute to the creation of such a context by fostering improved understanding and careful implementation of DL-enhanced EWS.

Recommendations

The possible adoption of DL into EWS could have mixed implications for nuclear risks. To some extent, these will be determined by the manner in which these AI learning techniques are developed and tested, and integrated into existing and new equipment, as well as the way this integration is accompanied by adequate training and doctrinal choices. The discussed implications from the possible integration of DL into EWS substantiate the call for open and transparent dialogue to contribute to the understanding of how technology could reduce and/or aggravate nuclear risks. Such dialogue needs to be comprehensive in terms of content and participation, covering all technologies with potentially disruptive effects to stability and engaging both governmental and non-governmental stakeholders, including industry and technical experts.

The following set of recommendations for diplomats and decision-makers outlines different pathways of how to multilaterally initiate such dialogue, what milestones are duly needed, and which activities on the national level are conducive to mitigating risks and increasing crisis stability.

Awareness Raising Measures

1. This paper sought to contribute to an open and public discussion of potentially disruptive implications from technological enhancements in the military domain. The complete range of stakeholders, including

⁵⁷ Andrea Gilli and Mauro Gilli, "Rethinking the Impact of Emerging Technologies on Strategic Stability," in *Europe's Evolving Deterrence Discourse* ed. by Amelia Morgan and Anna Péczeli (Center for Global Security Research, Lawrence Livermore National Laboratory, 2021), 113, https://cgsr.llnl.gov/content/assets/docs/ CGSR_euro_det_final.pdf.

⁵⁸ Horowitz and Scharre, Al and International Stability, 8.

⁵⁹ Boulanin, The Impact of Artificial Intelligence on Strategic Stability and Nuclear Risk, 92.

private and public actors, should engage in the discussion concerning the implications and interaction effects of emerging technologies for nuclear risks and strategic stability.

2. High-level intergovernmental initiatives, such as the P5 Process, the "Creating an Environment for Nuclear Disarmament" and the "Stepping Stones for Advancing Nuclear Disarmament" initiatives, should discuss the implications of emerging technologies on nuclear risks and strategic stability and report back to nuclear-specific multilateral fora, such as the upcoming Review Conference of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT). These state groupings include the majority of relevant state stakeholders and provide the diplomatic platforms to informally exchange views and explore potential paths forward. Below-mentioned transparency and confidence-building measures suggest milestones for these intergovernmental exchanges.

3. In addition to above-mentioned intergovernmental initiatives reporting back to the NPT Review Conference or crafting agreed language to be included in final texts, topics concerning potentially disruptive technologies should be discussed in the Main Committee I and Subsidiary Body 1 to the NPT Review Conference.

4. In the absence of dedicated multilateral fora to systematically review developments in technology that could have radical and novel implications for strategic stability, intergovernmental initiatives should lay the groundwork for the establishment of a majority in the UN General Assembly First Committee to mandate a Group of Governmental Experts (GGE), involving the views of technical, industry and other non-governmental stakeholders, to periodically and systematically examine technological developments in relation to the nuclear domain and develop recommendations for the consideration of Member States.⁶⁰

5. In line with its discussions and decisions in 2018, the Conference on Disarmament should re-establish the Subsidiary Body 5 and encourage discussions in line with its mandate.⁶¹

Transparency and Confidence-Building Measures

1. As the source of innovation, research and development does not lie primarily with state actors, it is essential not only to include, but to encourage private actors to participate in transnational discussions. Such discussion should also take place outside diplomatic fora, allowing for technical experts to interact and engage in transnational capacity building through sharing of best or worst practices on competence development and training, safety and security provisions, which could in turn contribute to confidence-building.⁶² States parties should provide appropriate funding for such events.

- 61 Renewed discussions within the Subsidiary Body 5 will contribute to increase understanding and trust among delegations on the implications of particular developments in science and technology, see Conference on Disarmament's decision CD/2119, decision CD/2126, and report CD/2141.
- 62 The Wiesbaden Process that focused on global export controls and non-proliferation measures in view of UNSC Resolution 1540 provides a useful example of how to organize open dialogue between private and public stakeholders, see "The Spirit of Wiesbaden: Preventing the proliferation of weapons of mass destruction," German Federal Foreign Office, November 24, 2017, accessed on 31 March 2021, https://www.auswaertiges-amt.de/en/ aussenpolitik/themen/aussenwirtschaft/-/692082.

⁶⁰ The establishment of a Group of Scientific Experts (GSE) under the auspices of the Conference on Disarmament presents another or additional pathway to facilitating technical discussions, as the example of the GSE and its contributions to the Comprehensive Nuclear-Test-Ban Treaty shows, see Ola Dahlman, Frode Ringdal, Jenifer Mackby and Svein Mykkeltveit, "The inside story of the Group of Scientific Experts and its key role in developing the CTBT verification regime," *The Nonproliferation Review*, 2020.

2. Crisis communication channels and designated points of contact between states, such as those that participate in above-mentioned intergovernmental initiatives, are vital for strengthening strategic stability and mitigating nuclear risks by reducing the likelihood and consequences of misperception, enabling de-escalation and peaceful resolution of disputes through crisis diplomacy, providing opportunities for information exchanges between military and scientific communities, and enhancing trust.

3. The goal of increasing transparency is already on the agenda of the P5 process and should not only be reinvigorated, but also expanded to include discussions of technological enhancements and modernisation of EWS. Such discussions need to aim to foster mutual understanding, reduce the risk of misperception, and eliminate incentives for arms racing, as well as to define the threshold for nuclear escalation.

4. In line with existing proposals within the NPT Review Conference context to de-alert nuclear forces, this discussion of disruptive technologies only adds to the need to reduce dependence on high-alert forces.³²

5. Additionally, intergovernmental initiatives should discuss the viability of missile launch notifications and the possibility of agreeing to such agreements in writing. States could build upon existing bilateral arrangements in order to establish a multilateral notification framework. This would generate an additional source of information that could be employed to scrutinise the performance of EWS, thereby reducing the risk of misperception.

State-Level Recommendations

1. Given the understandability and predictability problem of DL, it is difficult to anticipate how a DL system may behave in contexts and environments for which they have not been specifically tested. This calls for States that are integrating DL in EWS to set up a common task framework in order to minimise above mentioned risks stemming from technical shortcomings and human machine interactions by addressing the broadest possible conditions the system is likely to face if deployed.

2. Operational and technical training for all human operators that are likely to interact with the system through the development and deployment phase will contribute to enhancing the understanding of the DL systems' likely behaviours, notwithstanding their inexplicability problem, thereby reducing the abovementioned risks stemming from technical shortcomings and human-machine interactions. Therefore, states whose militaries are likely to interact with DL integrated EWS should set up detailed and comprehensive operational and technical training regimes for their military personnel.

3. Even though it might be tempting for decision-makers to rush the integration of DL into EWS, decisionmakers should be conservative when deciding when and where DL can be safely implemented. The selflearning capabilities of machines powered with this technique could create inadvertent escalation with potential devastating consequences with nuclear weapons on high alert status.

³² Two working papers to the 2019 Preparatory Commission for the 2020 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons address nuclear de-alerting specifically, see NPT/CONF.2020/ PC.III/WP.23 and NPT/CONF.2020/PC.III/WP.31.



Engaging the Next Generation on Isotope Hydrology

The Peaceful Uses, Nuclear Safety and Security Working Group

Authors: Emmanuel Abenanye, Stephen Beckett, Sebastian Brixey-Williams, Rafael Chesori, Anuradha Damale, Hadja Fanta Diakhaby, Fulgence Dione, Lorne Dryer, Halima Jemmal, Rachel Jones, Deandra Moerdaning, Huma Rehman, Wandile Shezi, and Setelekoane Tsehlahali.

Introduction

Sustainable Development Goal 6.1 calls for 'clean water and sanitation for all', yet 29% of the world population still lacks access to clean drinking water.³² Isotope hydrology could play a key role in improving water access and management.³³ However, in our scoping assessment, knowledge and implementation of this research tool remains scarce amongst the next generation of experts, particularly in the Global South,

³² WHO, 'Drinking Water', 14 June 2019, <https://www.who.int/news-room/fact-sheets/detail/drinking-water>.

³³ Isotopes are forms of chemical elements. When the composition of isotopes in a given water source is studied using isotope hydrology techniques, it can reveal important information about where the water comes from, its uses, its quality, and its age. This can provide scientists with key information to better preserve, trace, and secure water resources.

and better online resources could be designed to attract new talent. The PUNSS Working Group proposes three interventions to address this.

Recommendations

Create an Interdisciplinary Working Group

In conjunction with the Emerging Voices Network (EVN), it is proposed that an interdisciplinary working group is formed to evaluate existing material in the public domain and the opportunities it presents for learning. This group should have members from at least three areas: the IAEA as experts on current domain knowledge, potential audience members (the EVN could perform part of this role, along with wider representation from the Global South) and representation from an organisation familiar with e-learning. This group could identify areas where the provision of learning material could be improved, and support the development of the e-learning platform and the material that would be hosted on it.

Develop New Multimedia Resources for an Isotope Hydrology e-Learning Hub

Based on the recommendations of the Interdisciplinary Working Group and in partnership with the IAEA, new materials and resources should be generated to engage the next generation in isotope hydrology. This should be done with direct reference to the IAEA's existing materials and e-learning platform, the further development of which could make the materials more open access and allow better information retrieval. The e-learning platform should centralise existing resources related to isotope hydrology activity around the world, have the capability to connect and integrate other tools including social media such as Twitter, and host blogs and expert-led webinars. The text-information on the platform should be offered in more languages, and suitable accessibility measures should be taken to ensure a wide uptake of the resources.

Create an Integrated Communications Strategy and Community of Practice

The final recommendation relates to the importance of making the knowledge on isotope hydrology visible, inviting, and easily accessible for next generation experts in the Global South. The creation of a YouTube Channel where a series of videos, webinars, or conferences on isotope hydrology, for instance, could be used for effective outreach and awareness building. Launching an online competition, poster campaigns on social media channels such as a LinkedIn group and a Facebook page – in partnership with the IAEA and other key players – would help to promote the isotope hydrology e-learning hub globally. These activities would then form the foundation for a community of practice for isotope hydrology.

Conclusion

The PUNSS working group noted the need to enhance the generation and dissemination of knowledge on isotope hydrology amongst the next generation of experts, particularly in the Global South. Therefore, three actions have been proposed to address this, which are: to form an interdisciplinary working group to assess the status and nature of available information on the topic; to develop new functionality on isotope hydrology for the IAEA e-learning platform and new materials on the topic; and to create a communications strategy and subsequent community of practice for publication and support of new materials. If successful, these recommendations could also be applied to achieve the same objectives in respect of other peaceful uses of nuclear technologies.



Recommendations for Improving Non-Proliferation Efforts

The Non-Proliferation Working Group

Working Group Chair and Supporting Authors: Jessica Budlong, Julia Masterson and Natalia Zhurina.

A. Introduction

A.1. Background

The proliferation of nuclear weapons poses a persistent threat to international security. Although the Nuclear Non-proliferation Treaty (NPT) recognises five nuclear weapons possessor states, and though the treaty's architecture reinforces global norms against nuclear proliferation, the possession of nuclear weapons by non-treaty-recognised states, and the failure by certain NPT States Parties to meet their own obligations under the Treaty, continues to challenge the global nuclear non-proliferation regime.

A.2. Scope

The non-proliferation working group (hereafter referred to as "the working group") centred its research on two non-proliferation case studies: Iran and North Korea. Where the international community succeeded in curtailing the former's civilian nuclear programme and staving off its military breakout, the latter developed a robust and sophisticated nuclear weapons programme despite coordinated multilateral attempts to

prevent it from doing so. Both case studies exemplify important lessons for the future of non-proliferation policy. The working group identified three primary lessons from previous non-proliferation efforts, and in this paper puts forth five policy recommendations guided by those lessons. The policy recommendations outlined below are intended to inform future nuclear non-proliferation efforts and agreements.

North Korea is the newest state to acquire nuclear weapons, and Iran's civilian nuclear programme is developing at a pace that could raise concerns in the region over its nuclear ambitions and, in the worst case, prompt its neighbours to consider developing nuclear weapons to counter the perceived threat posed by Iran. There are several analogous patterns in the nuclear histories of North Korea and Iran. Both cases started with declarations of commitments to the nuclear non-proliferation regime, which evolved into promises of denuclearisation or nuclear limiting agreements with external powers, but which regrettably deteriorated into confrontation and nuclear escalation. The 1994 Agreed Framework agreement with North Korea and the 2015 nuclear deal with Iran, formally known as the Joint Comprehensive Plan of Action (JCPOA), were each considered a success story for nuclear non-proliferation but the Agreed Framework collapsed in 2002 and the future of the JCPOA remains uncertain.

The JCPOA is an agreement reached in 2015 between Iran, the permanent five members of the United Nations Security Council (China, France, Russia, the United Kingdom, and the United States), Germany, and the European Union. The agreement imposes limits – some permanent – on Iran's civilian nuclear programme in exchange for the alleviation of economic sanctions levied against Iran. The deal was negotiated with an aim to extend the length of time it would take for Iran to produce enough fissile material for a single nuclear bomb. Beyond that, the JCPOA commits Iran to strict verification and monitoring oversight from the International Atomic Energy Agency (IAEA) and prohibits Iran from ever pursuing a nuclear weapons programme or engaging in weaponisation activities. In May 2018, the United States withdrew from the agreement and reimposed stringent economic sanctions against Iran. One year later, Iran began breaching JCPOA limits, including by limiting IAEA inspector access to its nuclear sites. As of March 2021, discussions surrounding U.S. re-entry to and restoration of the deal, and the possibility for follow-on agreements to strengthen and lengthen the accord, are ongoing.

Provoked by North Korea's announcement of its intention to withdraw from the Nuclear Non-Proliferation Treaty (NPT) and its non-compliance with IAEA safeguards, the Agreed Framework was reached between the United States and North Korea, signed in October 1994. The agreement proposed the replacement of North Korea's indigenous nuclear power reactor with two, more 'proliferation-resistant', light-water reactors in exchange for supplementing North Korea with fuel oil pending construction of the reactors. This would provide formal peace and national security assurances to North Korea, against the threat or use of nuclear weapons by the United States. Nevertheless, U.S.-North Korea relations remained tense. Washington did not live up to its end of the bargain. Heavy fuel shipments were often delayed, and little progress was made toward normalising diplomatic or economic relations. The Agreed Framework collapsed in 2002 after the United States accused North Korea of pursuing uranium enrichment activities, a violation of their commitments under the Agreed Framework, and North Korea condemned the slow construction of lightwater reactors.

Following North Korea's withdrawal from the NPT in 2003, China, Japan, Russia, North Korea, South Korea, and the United States began meeting through the Six Party Talks, a dialogue aimed at finding a peaceful resolution to the security concerns about the burgeoning North Korean nuclear programme. Meetings consisted of six rounds of negotiations and succeeded in garnering an agreement from North Korea to shut down its nuclear facilities in exchange for fuel aid and steps towards the normalisation of relations with the United States and Japan. North Korea tested its first nuclear weapon in 2006, emerging as a nuclear-weapon state, but productive and intermittent discussions continued between the Six Parties for several years. After the United Nations Security Council issued a statement condemning North Korea's failed satellite launch, North Korea declared on April 14, 2009 that it would pull out of Six Party Talks.

B. Lessons from Previous Non-Proliferation Efforts

B.1.a. Engage Regional Partners

Israel and the Gulf States, namely Saudi Arabia, Bahrain, and the United Arab Emirates, have expressed concern that the JCPOA failed to adequately curtail Iran's nuclear programme, or the military threat posed to the region by Iran's ballistic missiles and support for proxy groups. Although the JCPOA succeeded in temporarily alleviating the risk that Iran's nuclear programme would continue developing at a rapid pace, it granted Tehran increased capital through sanctions relief that Riyadh, Manama, and Abu Dhabi, along with Tel Aviv, view as supporting Iran's destabilising activities in the region. Since these nations were not involved in the negotiation process of the P5+1 and Iran, their concerns were left to be addressed in future regional agreements, which ultimately decreased buy-in from Iran's neighbours.

South Korean officials felt sidelined by negotiations on the Agreed Framework and by Washington and Pyongyang's failure to include Seoul in important dialogue that directly affected its national security interests. South Korean public support for the non-proliferation agreement waned throughout the eight years the agreement was in place, jeopardising the political and financial support needed to preserve the framework. For its part, North Korea was dissatisfied with South Korea's involvement in the provision of light water reactors under the deal, which required an elaborate arrangement whereby South Korea informed the technical modelling of an "original US design." North Korea deemed the delayed construction of those reactors a violation on the part of the United States, which contributed to the collapse of the agreement in 2002.

The Six Party Talks succeeded in reaching several critical breakthroughs: North Korea pledged to abandon its nuclear weapons and return to the NPT in 2005 in exchange for certain concessions from the other states, and the Six Parties outlined an implementation roadmap in 2007. Regional partners played a critical role in garnering those concessions from North Korea. South Korea agreed not to host U.S. nuclear weapons on the Korean peninsula, and, together with China, Japan, Russia and the United States, expressed a willingness to supply North Korea with energy aid. Japan also pledged to normalise relations with North Korea. Those achievements never came to fruition but exemplify an important lesson on the value of regional dialogue and engagement. Even in cases as acrimonious as tense relations on the Korean peninsula, maintaining ongoing dialogue – even if that dialogue is slow to produce tangible outcomes – is a powerful sign of possibility.

B.1.b. Policy Recommendations

Nuclear non-proliferation agreements and regional stability efforts need not be deeply intertwined, but they must support, complement, and strengthen the other. For example, where malign behaviour and threats of violence plague regional support for such agreements, negative security assurances can be exchanged for formal recognition and endorsement of non-proliferation agreements by all states in the region.

Regional partners should lead regional talks. In the Middle East, the existing Gulf Cooperation Council (GCC), comprising the United Arab Emirates, Bahrain, Saudi Arabia, Oman, Qatar, and Kuwait, is well-suited to coordinate and mediate regional discussions to directly address the concerns of Iran and its neighbours. In East Asia, a revival of the Six Party Talks can provide a similar platform for discussion. In all instances, regional coordination is essential for alleviating concerns which may plague relations between states and jeopardise support for non-proliferation agreements.

Non-proliferation agreements should strengthen and further integrate regional economic systems. Such agreements should ease the burden of trading between regional states by encouraging economic engagement, including by imposing systems to facilitate consistent and uninterrupted trade efforts. The JCPOA Procurement Channel and the Instrument in Support of Trade Exchanges (INSTEX) special purpose vehicle, created by the European members of the deal to trade with Iran without incurring penalty from U.S.

secondary sanctions, provide a starting point upon which to model economic channels accompanying future non-proliferation agreements. By continuing to intertwine regional economic systems, agreements can strengthen ties between nations and create more incentives to negotiate. Rather than bypassing current systems, non-proliferation agreements must continue to utilize structures in place while strengthening them through norms. In instances where regional partners have the opportunity to play a direct role in a nuclear non-proliferation agreement, as Japan and South Korea did after the Korean Peninsula Energy Development Organisation (KEDO) delegated responsibility to them for financing and supplying two lightwater reactors to North Korea under the Agreed Framework, emphasis should be placed on ensuring those states have the financial means and political will to do so.

B.2.a. SMART Goals

The Agreed Framework had broad objectives that laid out a general agreement to work towards nonproliferation, yet lacked specific, measurable, attainable, relevant, and time-based (SMART) goals. The agreed-upon objectives were interpreted differently by each nation due to their lack of specificity and were never realised. Gaps in verification due to non-specific timelines for IAEA inspectors undercut confidence and credibility for attaining these worthy goals. The Six Party Talks also failed to provide specific goals for non-proliferation efforts and ultimately were unsuccessful in preventing the development of North Korea's nuclear programme.

In contrast to the Agreed Framework, the JCPOA utilized SMART goals through specific timelines, enrichment limits, and mutually agreed language. It also called for time-based future negotiations and further diplomatic efforts to continue the pursuit of its objectives. This intricate agreement which focused on technical elements of non-proliferation and was thus verifiable by the IAEA is one example of how SMART goals can be applied in practice to greater success.

B.2.b. Policy Recommendations

Non-proliferation agreements should include SMART goals, which provide necessary timelines for implementation and verification, as well as future negotiations. By including specific and attainable goals, agreements are more sustainable and build confidence in their value to allies. Learnings from the JCPOA experience suggest that technical limits can provide a clear roadmap for verified non-proliferation and reduce opportunities for covert treaty abrogation. Rather than working towards full normalisation of relations, agreements should create a clear and structured pathway for all participants to realise key goals.

B.3.a. Consider the Role of Other Regional Agreements

There are five recognized nuclear weapon free-zones (NWFZ) worldwide, and efforts are underway to create a sixth, broader, weapons of mass destruction-free zone in the Middle East which would also ban chemical and biological weapons. Work to create this Middle East WMDFZ has stalled in the face of intense disagreements, yet the initiative remains an important factor in future non-proliferation efforts. Such a zone would reaffirm the commitments of Iran under the JCPOA, for instance, and could support similar arrangements involving other countries in the region moving forward. A regional zone free of weapons of mass destruction under stringent safeguards will also create stronger reinforcement mechanisms by obligating an added level of commitment to staying nuclear-free, and build confidence in the region regarding the intentions of Iran and its neighbours. Current proposals for a Middle East WMDFZ include calls for comprehensive peace negotiations on other contentious issues in the region, and remain an important bellwether for the viability of future non-proliferation efforts.

The 1992 Joint Declaration of South and North Korea on the Denuclearization of the Korean Peninsula has featured in nearly all negotiations aimed to curtail North Korea's nuclear weapons development. Under the Joint Declaration, both states on the Korean peninsula agree not to test, manufacture, produce, receive, possess, deploy, or use nuclear weapons. They further pledge to not pursue uranium enrichment or

plutonium production programmes, and to use nuclear energy for exclusively peaceful purposes. The Agreed Framework agreement obliged Pyongyang to uphold the Joint Declaration, and, in 2002, the United States cited North Korea's uranium enrichment programme as a violation of that 1992 arrangement and thus a breach of the Agreed Framework itself, ultimately collapsing the Agreed Framework.

B.3.b. Policy Recommendations

Non-proliferation efforts should consider the role of regional agreements but must integrate them in a careful and coordinated manner. In the case of the Agreed Framework, blanket citation of the Joint Declaration meant that the treaty could be quite limited in its provisions, but the Framework failed in part because it rested on the contingency of compliance with a secondary agreement. Citation of a WMD-free zone treaty in a future agreement with Iran can serve as a mechanism to reinforce and uphold Iran's commitments under both accords, and can promote regional dialogue that supports nuclear non-proliferation efforts. However, all parameters of the resultant non-proliferation agreement should also be explicitly outlined in the text of the agreement itself. In the Middle East, despite the fact that not all local states support the modality of ongoing discussions toward a WMD-free zone, it is important that states pursue negotiations toward its establishment. Regional partners should consider the entry into force of the prospective WMDFZ treaty, even if not all the parties accompany the process from the beginning. The 1967 Treaty of Tlatelolco, which established the NWFZ in Latin America and the Caribbean, took 35 years to achieve its full consolidation. Cuba ratified the Treaty in 2002, marking the last state in the region to join the Treaty. Negotiations toward a similar arrangement in the Middle East should commence in the near future, even without support by all regional partners.

C. Conclusion

Past nuclear non-proliferation efforts can provide important lessons for future policy, especially the fundamental importance of incorporating regional partners in both the negotiations toward and the resultant frameworks of any agreements.

The working group proposes that future nonproliferation efforts should engage regional allies, focus on achieving SMART goals, and consider the role of extant agreements and cooperative security structures.



NextGen: the Key to Unlocking Diversity and Inclusion in the Nuclear Weapons Policy Field

The Diversity and Inclusion Working Group

Authors: Cristopher Cruz, Jessica Margolis, Gustavo Pereira, Kseniya Pirnavskaia, Jana Wattenberg and Claudia Westwood.³²

The Problem - A Lack of Diversity in the Nuclear Weapons Field

In recent years, a debate has emerged in the nuclear weapons field about the need to diversify its practitioners and perspectives.³³ We understand diversity both in terms of the demographic characteristics of the actors who shape nuclear policies, and in terms of the perspectives which practitioners use to

³² The authors would like to thank Ana Alecsandru, Alice Cunha da Silva, Virginia Kerr, Matt Korda, Amy Lightfoot, Sophie McCormack, Primerose Ruhukwa and Luba Zatsepina-McReadie for their input in the first discussion of the policy brief theme.

³³ NSquare (2019). Greater Than: Nuclear Threat Professionals Re-imagine Their Field. Washington, DC: December 2019); Korda, M, 2019. At Nukefest, We Asked All the Wrong Questions. Inkstick; SGS Statement on Countering Systemic Racism and Other Structures of Exclusion and Domination. Available at: https://sgs.princeton.edu/ news-announcements/news-2020-07-20 [Access 21 June 2021]

approach nuclear issues. The former understanding, pertaining to demographic characteristics such as gender, ethnicity, and age heterogeneity, is more commonly recognised within discourses on diversity, equity and inclusion, and is often the focus of significant policy interventions. However, the latter, ideological diversity, is equally important to ensure that the nuclear weapons field is infused with new thinking. Our policy brief is designed to encourage practitioners working on nuclear policy issues to improve their strategies for the inclusion of both marginalized perspectives and groups.

Perspectives: Nuclear policy debates would benefit from the inclusion of feminist, post-colonial and youth perspectives. Feminist perspectives encourage the replacement of national security concepts with human security lenses.³⁴ They also promote the development of sustainable initiatives for the inclusion of women and other under-represented groups in the nuclear community.³⁵ Postcolonial perspectives provide tools for practitioners to acknowledge the racist foundations of discourses and negotiations,³⁶ highlight the importance of marginalized communities throughout the history of decisions to develop and/or disarm nuclear weapons,³⁷ and emphasize how industrial processes related to nuclear weapons' production and testing have been pursued through the exploitation of specific regions of the world.³⁸ Youth perspectives reflect the interests of generations whose futures are determined by present nuclear tensions and urge policymakers to be open-minded about strategies for nuclear policy change that could lead to a safer and more sustainable future for all generations.³⁹ All of these perspectives enable practitioners to design more inclusive nuclear policy proposals.

Demographic: The groups that debate and implement nuclear policies need to become more inclusive. A 2019 report by the United Nations Institute for Disarmament Research found that in non-proliferation and disarmament forums with more than 100 delegates, individuals identifying as women make up only 32 percent of individuals present. In forums with fewer than 100 delegates, only 20 percent are women, on average.⁴⁰ This is despite numerous gender parity initiatives throughout the last few years, such as the Gender Champions in Nuclear Policy programme.⁴¹ Few, if any, of these initiatives advocate for more inclusion of gender non-binary people or those who do not conform to socially constructed concepts of gender.⁴² There is also a stark lack of racial and ethnic diversity in the nuclear field. Ambassador Bonnie

- Tickner, A. J. (2001). Gendering World Politics. Issues and Approaches in the Post-Cold-War Era. New York: Columbia University Press; Enloe, C. (2014). Bananas, Beaches and Bases. Making Feminist Sense of International Politics. Berkeley, Los Angeles, London: University of California Press.
- 35 Ouadraat, C. de J. and Wattenberg, J. (2021). A Gender Framework for Arms Control and Disarmament. *WIIS Policy Brief.*
- 36 Scarry, E. (2020). The Racist Foundation of Nuclear Architecture. Boston Review.
- 37 Vincent, I. (2015). African Americans Against the Bomb: Nuclear Weapons, Colonialism, and the Black Freedom Movement. Stanford Nuclear Age Series.
- 38 Gabrielle, H. (2012). Being Nuclear: Africans and the Global Uranium Trade. Cambridge, Mass: MIT Press.
- The Nuclear Sites Project of the Global Decolonization Initiative at Boston University examines the legal, political and social processes through which local populations at nuclear sites have suffered from nuclear weapons' testing and mining. Boston University, Global Decolonization Initiative. Information available at: https://www.bu.edu/pardeeschool/research/research-initiatives/global-decolonization-initiative/ [Access 21 June 2021]
- 39 Carson, L. (2018). Why youth and feminist activism matters: insights from anti-nuclear campaigns in practice. *Global Change, Peace & Security*, 30:2, p.261-69.
- 40 Hugo, T. G., Egeland, K., and Østern, G. (2020). Patterns of Participation in Multilateral Disarmament Forums. Norwegian People's Aid.
- 41 Gender Champions in Nuclear Policy Initiative. Information available at: https://www.gcnuclearpolicy.org/ about/#:~:text=Gender%20Champions%20in%20Nuclear%20Policy%20is%20de
- signed%20to%20augment%20and,of%20the%20nuclear%20policy%20sector [Access 21 June 2021]
- 42 Commendable steps to expand the understanding of gender identities and sexuality in the nuclear field have been made by scholars and activists such as Ray Acheson, Catherine Eschle and Anna Feigenbaum. See for instance:

Jenkins, founder of the organisation Women of Color Advancing Peace and Security (WCAPS), for instance noted that "the very small representation of people of color in professional roles" has been a constant throughout her career in weapons of mass destruction policy.⁴³ Other sources highlight the systematic racism that Black and non-Black professionals of colour face in the nuclear community.⁴⁴ Youth activists reproach that "young people under the age of 25 make up almost half of the world's population, but their voices are largely missing when it comes to political decision-making."⁴⁵ UN Security Council resolution 2250 affirms the important role that youth can play in peace and security efforts;⁴⁶ and a multitude of next-generation (NextGen) initiatives reflects the realization that the voices of young people are missing in the nuclear community.⁴⁷ The EVN network itself has been created with the aim to promote collaboration, bridge-building and dialogue between next generation leaders, by providing an inclusive platform for youth experts to be heard on key nuclear issues and institutions, with a particular emphasis on engaging, empowering and connecting women and young people from the Global South.

Practitioners have already taken commendable steps to improve the diversity of people and perspectives in the nuclear weapons field: states, think tanks and NGOs have begun to address gender inequality in the nuclear weapons field with concrete action.⁴⁸ Some groups, such as the movement behind the Treaty on the Prohibition of Nuclear Weapons, have used feminist perspectives in the development of their campaigns.⁴⁹ Research organisations have committed to addressing the racial dimensions of nuclear policy discourses.⁵⁰ Yet, we propose that more can be done to improve current strategies to highlight and listen to NextGen perspectives. We believe that a more sustainable inclusion of the NextGen in nuclear policy processes can

Acheson R. (forthcoming). Feminist Solution: Draw on Feminist, Queer, and Indigenous Theory and Experiences to Support Movements to End Nuclear Weapons, in Megan Mackenzie (ed.), Feminist Solutions for Ending War; Eschle, C. (2013). Gender and the Subject of (Anti) Nuclear Politics: Revisiting Women's Campaigning Against the Bomb. International Studies Quarterly, 57:4, pp. 713-24; Feigenbaum, A. (2010). Now I am a Happy Dyke!: Creating Collective Identity and Queer Community in Greenham Women's Songs. Journal of Popular Music Studies, 22:3, pp.367-88.

- 44 Turner, K. M., et al. (2020). A Call for Antiracist Action and Accountability in the US Nuclear Community. *Bulletin of the Atomic Scientists*.
- 45 Carson, L. (2018). Why youth and feminist activism matters: insights from anti-nuclear campaigns in practice. *Global Change, Peace & Security*, 30:2, pp. 261-69.
- See also: United Nations Development Programme (UNDP) (2013). Enhancing Youth Political Participation Throughout the Electoral Cycle.
- 46 United Nations Security Council Resolution 2250 (2015). Information available at: http://unoy.org/wp-content/ uploads/SCR-2250.pdf [Access 21 June 2021]
- 47 See for instance: EU NPDC next-generation workshops: https://www.nonproliferation.eu/activities/internationalconferences/next-generation-workshop/ [Access 21 June 2021]; EU NPDC Internships: https://www.nonproliferation. eu/evenement/eu-non-proliferation-and-disarmament-internships/ [Access 21 June 2021]; CSIS Nuclear Scholars Initiative/Next-Generation Nuclear Network: https://nuclearnetwork.csis.org/apply/nuclear-scholars/ [Access 21 June 2021]; Events organised by the UK Project on Nuclear Issues: https://rusi.org/projects/uk-project-nuclearissues [Access 21 June 2021]
- 48 See for instance: Working Paper submitted by Ireland: Gender in the Non-Proliferation Treaty: recommendations for the 2020 Review Conference, 7 May 2019, New York; Working paper submitted by Australia, Canada, Ireland, Namibia, Sweden and the United Nations Institute for Disarmament Research: Improving gender equality and diversity in the Non-Proliferation Treaty review process.
- 49 Treaty on the Prohibition of Nuclear Weapons, A/Conf.229/2017/8 (New York: United Nations, July 7, 2017.
- 50 See for instance: SGS Statement on Countering Systemic Racism and Other Structures of Exclusion and Domination. Information available at: https://sgs.princeton.edu/news-announcements/news-2020-07-20 [Access 21 June 2021]

⁴³ Jenkins, B. (2018). Grand Challenge: Bringing a diversity of perspectives into nonproliferation policy. *Brookings Institute.* Information available at: https://www.brookings.edu/blog/order-from-chaos/2018/06/08/grand-challengebringing-a-diversity-of-perspectives-into-nonproliferation-policy/ [Access 21 June 2021]

not only increase the field's demographic diversity, but also further facilitates the inclusion of new perspectives, such as feminist and post-colonial visions to the betterment of nuclear policy and global security overall.

The Solution – The Next Generation as the Key to Unlocking Diversity

We use NextGen as an all-encompassing term meant to be inclusive rather than exclusionary. With it, we refer to individuals who are in the process of establishing themselves in the field, those with limited experience in policy and those who seek to advance a new, innovative, policy agenda. The next generation of practitioners working on nuclear policy issues can increase both the demographic and ideological diversity of nuclear policy by offering new perspectives from actors and social groups that are currently and traditionally underrepresented. In doing so, NextGen participation could facilitate the sustained and meaningful inclusion of feminist, postcolonial and youth perspectives on critical issues such as disarmament, non-proliferation and arms control. NextGen representatives have the potential to challenge the status quo and to normalise considering and including novel, progressive and innovative solutions to intransigent challenges. In the early stages of their careers, these young professionals might be particularly "open-minded about different strategies for change."⁵¹

There may also be value in less experienced professionals applying themselves to intractable challenges. Early-career professionals, while still learning to navigate the fault lines and political topography of the nuclear policy field, often bring policy dialogue back to the fundamentals, anchoring discussion on nonproliferation, for example, in the core mission of the work instead of the challenges and frustrations faced continually throughout a longer career. NextGen practitioners can bring fresh energy, enthusiasm and a passion for learning to bear on complex challenges, and may be better equipped to remove their thinking from some of the politics of nuclear policy, given the lower profile of their work. In short, having NextGen experts apply themselves to a challenge in nuclear policy could help reset and refresh stagnant, deadlocked debates.

Youth around the world have a clear interest in nuclear policy and identify themselves as stakeholders in the debates occurring today that will shape their future; this is best evidenced by the significant global membership of organisations like the CTBTO Youth Group,⁵² along with multiple regional and global nuclear disarmament youth networks and bodies.⁵³ NextGen inclusion is integral to updating how the nuclear field addresses issues that change over time and generations. For example, with the rise of new technologies, key concepts in nuclear security have morphed significantly to respond to new threats and opportunities. Practitioners must now consider the potentialities created by cyber capabilities as critical components of the international security landscape, for example, and how the increasing accessibility of space-based capabilities is complexifying arms control and nuclear risk debates. NextGen policymakers have grown up with a globalised understanding of security and diplomacy and have a clear vision of the potential impacts of technology on stability, warfare and nuclear risk.

⁵¹ Carson (2018), p, 266.

⁵² CTBTO Youth Group. Comprehensive Nuclear-Test-Ban Treaty Organization. Information available at: https://www. ctbto.org/specials/ctbto-youth-group/ [Access 21 June 2021]

⁵³ See for instance: Abolition 2000 Youth and Nuclear Disarmament Working Group (A2K Youth Network): https:// www.abolition2000.org/en/working-groups/abolition-2000-youth-and-disarmament-working-group/ [Access 21 June 2021]; The Amplify Youth Network: https://www.amplifyyouth.org [Access 21 June 2021]; Student Young Pugwash: https://britishpugwash.org/student-young-pugwash/ [Access 21 June 2021] or Peace Action New York State (PANY): https://www.panys.org [Access 21 June 2021].

To increase NextGen involvement, it is necessary to expand access to the nuclear policy field and to promote the retention of young, diverse experts. Adequate representation of NextGen perspectives in organisations, institutions, and other structures will facilitate the inclusion and active participation of younger experts in critical policy discussions and processes, including core decision-making, in the long term. Sustainable NextGen engagement could also help to avoid problems of 'NextGen tokenism' where a single NextGen representative is asked to speak on behalf of all NextGen and/or young people.⁵⁴ It will also establish a skilled cohort with whom established policymakers can engage and consult. Inclusion must be embedded in coherent and systematic policies both within organisations and the field in general to become standard practice rather than an exception. We identified four main areas in which practitioners can help to advance the inclusion and retention of NextGen voices in the nuclear weapons field.

Our Strategies: Practical Steps to Advance NextGen Participation in Nuclear Policy

Educational Opportunities

There are many educational opportunities in the field of nuclear non-proliferation, disarmament and arms control. Prominent examples include University of San Diego's Public Policy and Nuclear Threat Boot Camp (PPNT),⁵⁵ the Wilson Center's Nuclear History Boot Camp,⁵⁶ or the CSIS Nuclear Scholars Initiative.⁵⁷ These courses provide critical knowledge transfer from senior to junior colleagues while enabling NextGen individuals to build valuable professional networks. Low technical knowledge or a lack of official qualification in nuclear issues can be an impediment to NextGen actors advocating for themselves, and so education programmes in nuclear policy incentivise and enable NextGen actors to enter the field, while empowering young experts to voice their ideas in professional settings. At present, NextGen courses are often one-off events, and engagement with young participants is not sustained beyond the length of the course.

We propose three strategies to improve education programmes for NextGen community members. First, organisers should build alumni networks for participants to remain in touch with colleagues, exchange contacts, research, and ideas, and cultivate a greater sense of community. Second, educational programmes must include a focus on feminist, postcolonial and youth perspectives on nuclear policy to spark innovative thinking and dialogue from the very first steps in nuclear policymakers' careers. Lastly, organisations should implement and be transparent about their diversity mechanisms, such as affirmative action, methodical consideration of structural and financial barriers to access, and offering reasonable adjustment options, throughout selection processes for education opportunities as well as possible financial support.

Internships and Employment Opportunities: Lowering Financial Barriers

Internships can provide a valuable stepping stone for young professionals to start their careers in nuclear policy, but financial barriers are a key obstacle in this area. Many internships at prominent organisations working on nuclear policy issues are unpaid or offer only a small stipend, and are often short-term, lasting just twelve, six or even three months. Opportunities in nuclear policy are often disproportionately

⁵⁴ Carlson (2018), p. 267.

⁵⁵ Public Policy and Nuclear Threat Boot Camp. Information available at: https://igcc.ucsd.edu/training/ppnt/index. html [Access 21 June 2021].

⁵⁶ Nuclear History Boot Camp: https://www.wilsoncenter.org/nuclear-history-boot-camp [Access 21 June 2021].

⁵⁷ CSIS Nuclear Scholars Initiative: https://nuclearnetwork.csis.org/apply/nuclear-scholars/ [Access 21 June 2021].

concentrated in certain locations – particularly New York, Washington DC, Geneva, Vienna and London – making them inaccessible to those not located in these areas or who are unable or unwilling to move there. Applying for internships, even unpaid positions, can be a time-consuming and lengthy process as well, some taking up to nine months, and typically requiring constant internet access which cannot be considered as a given for all candidates. These barriers are acutely challenging for young professionals from the Global South, for whom the costs of international travel and living costs in large, expensive cities may be insurmountably burdensome.

Furthermore, formal early-career employment opportunities in nuclear policy are both scarce and highly competitive, creating further financial barriers to retention. Many early-career positions are explicitly supported by fixed-term project funding, meaning that ongoing employment is not possible, and young professionals receiving inadequate remuneration while they are employed may struggle to sustain a longer period of job searching in a competitive market, after the end of an internship or fixed-term role. The high degree of competition for roles may even reproduce traditionally homogenous cohorts of young experts, when hiring managers feel unable to 'risk' employing young staff with diverse or unfamiliar backgrounds, qualifications and experiences.⁵⁸A lack of formalised, professionalised pathways for career development in nuclear policy for NextGen professionals is also a significant barrier to retention, as many young people seek a sense of stability in their careers and clear steps for advancement as their professional goals and interests begin to crystallise.

Without adequate remuneration and employment opportunities, particularly for those from the Global South, early-career pathways reproduce traditional marginalisation within the nuclear policy community. Streamlining and demystifying application processes as well as providing application support will help to diversify candidate pools and the early-career cohort.⁵⁹ Beyond these resources, improving pathways for NextGen experts will require greater financial investment in entry-level opportunities.

Retaining NextGen Talent: Mentorship

In recent years there has been a marked growth in the number of structured mentorship programs focused on encouraging early career participation and advancement in international security, and specifically nuclear policy. Examples from Europe and North America include organisations such as Girl Security, Women in International Security (WIIS), Women of Color Advancing Peace and Security (WCAPS) and the joint programming of the Vienna Centre for Disarmament and Non-Proliferation (VCDNP) and the Istituto Affari Internazionali (IAI).⁶⁰ This is a positive development; structured mentorship schemes reduce the not insignificant burden on NextGen individuals to identify willing, engaged mentors, and more particularly facilitate the inclusion of mentors and mentees from underrepresented groups. One way to improve mentorship in nuclear policy would be to couple NextGen education programmes with mentorship opportunities. In this way, education initiatives could become more sustainable by enabling participants to remain connected to the senior professionals they have encountered during educational courses.

⁵⁸ Enright, E (2020). Addressing the 'Leaky Pipeline': Taking the Temperature of the UK's Early Career Nuclear Weapons Policy Cohort. The 2020 UK PONI Papers. Information available at: https://rusi.org/sites/default/files/202011_poni_ papers_2020_web.pdf [Access 21 June 2021].

⁵⁹ A good example for events and workshops that help NextGen to prepare for interviews and applications have been recent events in the UK PONI Nuclear Café event series: https://rusi.org/rusi-news/uk-poni-nuclear-café [Access 21 June 2021].

⁶⁰ Girls Security Mentoring Programs: https://www.girlsecurity.org/become-a-mentor [Access 21 June 2021]. Women in International Security Mentorship Programs: https://www.wiisglobal.org/programs/mentor-and-professionaldevelopment-program/ [Access 21 June 2021] WCASP mentorship scheme: https://www.wcaps.org/ mentorshipprograms [Access 21 June 2021]; VCDNP and IAI Young women in nuclear mentorship program: https:// www.iai.it/en/news/young-women-non-proliferation [Access 21 June 2021].

Engaging NextGen Voices: Outreach in Nuclear Organisations

In the nuclear field, more could be done to take the messages, debates and discussions taking place in nuclear policy to NextGen actors. Firstly, organisations can develop strategies to employ, sponsor and create platforms for young experts, coordinate international youth engagement and skills development programmes, and disseminate the writing and research of members of underrepresented groups. Organisations could develop specific teams or projects aimed at increasing their focus on targeting messages and opportunities to NextGen actors. This could be done through the creation of subsidiary, youth-specific arms of organisations which could launch inclusive programmes, source funding opportunities and build a supportive, dedicated community to champion the development of new organisations. Online platforms can allow for virtual networking but can also serve as a database for organisations looking to engage the next generation: one salient example is the Brussels Binder,⁶¹ a platform for identifying and connecting leading women in European security. Similar platforms in global nuclear policy could be an asset for young people and organisations to share resources, advertise and find employment opportunities and build diverse professional networks. Establishing specific youth representatives in prominent NGOs would bring NextGen perspectives to the highest levels of nuclear policy problem-solving. Aiming to universalise the institution of youth representative positions at all major international organisations could allow for the standardisation and systemic inclusion of NextGen perspectives in nuclear policy and would signal commitment to championing diverse voices.

⁶¹ The Brussels Binder. Information available at: https://brusselsbinder.org [Access 21 June 2021]



The Next Generation's Arms Control Agenda for 2050

The Arms Control Working Group

Authors: Stacy Achoki, Julia Balm, Zuzanna Gwadera, Patricia Jaworek, Tanvi Kulkarni, Sang Hyeok Lee, Jinki Lee, Lucky Mametja, Martha Mariana Mendoza Basulto, Sylvia Mishra, Valentina Papu, Eva-Nour Repussard, Carlos Rodriguez-Cruz Y Celis, Alice Saltini, Anna Wagner, Luc Wilson, Morgan Slessor

Recent years have seen a slow but steady erosion of the existing global arms control architecture along with a continuous degradation of trust and stability in the international security environment. Indicative of these developments is the U.S. withdrawal from the Intermediate-Range Nuclear Forces (INF) Treaty in 2019, which effectively terminated a historically important pillar of the bilateral arms control framework between the U.S. and Russia. Similarly, U.S. withdrawal from the Open Skies Treaty underlines the downward trajectory of transparency and mutual trust—a trend furthered by the UK's recent decision to raise the limit to its nuclear stockpile. While a complete dissolution of the arms control framework has ultimately been averted by the full and unconditional extension of the New Strategic Arms Reduction Treaty (New START) for another five years, recurring noncompliance with treaty obligations, complex regional dynamics and the emergence of new technologies will require creative and flexible solutions to strengthen arms control and reduce the risks posed by nuclear weapons.

The goal of this paper is to establish an arms control agenda for the coming decades, looking to 2050. It draws from the perspectives of next-generation leaders in nuclear policy who seek increased international

cooperation targeted at reducing nuclear risks. Its time horizon was established with the understanding that realistic nuclear arms control measures require a significant investment of time and political capital. For the scope of this paper, arms control refers to measures taken by states to "minimis[e] the costs and risks of arms competition, curtail the scope and violence of war in the event it occurs,"³² and limit destabilising military options. This paper focuses on long-term regional dynamics between the U.S., Russia, and China, and addresses the complications posed by emerging technologies on strategic stability and nuclear dynamics. It outlines ambitious and creative objectives for future arms control agreements.

The impact of regional dynamics on arms control

As opposed to the bipolar structure of the Cold War period, relations between nuclear-weapons possessor states (NWS) have become increasingly complex and multipolar. Today, the US-Russia dyad is interconnected with several regional and global dynamics. China's growing influence on the global security architecture now affects relations between the US and Russia, and adds complexity to achieving diplomatic progress with the Democratic People's Republic of Korea (DPRK). Driven by distinct threat perceptions, the shift towards multipolarity has been accompanied by heightened tensions; strategic relations between NWS that were characterised by cooperative tendencies in the post-Cold War period have degenerated to more competitive and confrontational modalities. In recent years, NWS have accelerated modernisation efforts while arms control treaties between US-Russia have almost all fallen apart. This further leads to a lack of transparency. Increasingly ambiguous nuclear doctrines and capabilities have only added to the strategic environment's volatility and increased the risk of accidental nuclear conflict.

Arms control efforts in East Asia have been hampered by imbalance. While traditional bilateral arms control efforts have been targeted at ensuring parity of nuclear arsenals through reciprocal reductions, there are drastic differences in the size of China's nuclear arsenal in comparison to that of the US and Russia. As such, there is little appetite to engage in negotiations aimed at establishing limits on arsenal size. The changing global security landscape therefore necessitates a flexible and asymmetric arms control architecture that values but is not limited to achieving parity and is responsive to the multi-polar reality of present-day nuclear threats.

While engaging China in capability management remains a challenging goal, strategic risk reduction presents a readily accessible opportunity for cooperation. The risks created by nuclear possession and use are persistent, and all NWS share incentives to minimise them. A structured effort to establish dialogue on risk reduction would help narrow the perception gap on each other's nuclear postures. For example, specialized working groups could be established in the P5 context—or bilaterally between different NWS—to thoroughly examine possible escalation dynamics and propose mitigation strategies. Working groups should address the need to increase transparency on nuclear arsenals and discuss individual nuclear doctrines and force postures. Additional discussion could centre on de-alerting as well as the implications of new disruptive technologies. That way, risk reduction measures can serve as a tool in the medium term to enhance transparency and mutual trust and can facilitate creation of a favourable environment for long term arms control engagement with China and other NWS.

The extension of New START is a welcome development that sets the stage for movement towards a more resilient arms control architecture. A follow-on multilateral arms control agreement among NWS states would be a useful mechanism for the cooperative mitigation of emerging threats. Rapidly advancing military capabilities of certain P5 states, currently unbound by bilateral agreements, have raised concerns that technological innovation may be leveraged for destabilising purposes. A multilateral treaty among the P5,

Thomas C. Schelling and Morton H. Halperin, Strategy and Arms Control (New York: The Twentieth Century Fund, 1961), 2.

initiated by the U.S. and Russia — with the United Kingdom, France and China taking part in discussions — is an ambitious but worthwhile goal. In formulating such a treaty, these states should pursue a mix of concrete reductions and legally-binding confidence- and transparency-building measures, which would be useful in demonstrating a commitment to restraint and balance.

The intersection of space, cyber, and nuclear domains and implications for nuclear risk and arms control

The international approach to non-proliferation and arms control cannot remain static in a dynamic environment characterised by new actors and emerging technologies. It will be crucial to integrate military and government operations in space into the global arms control architecture, given that space is an increasingly competitive and contested domain that lacks sufficient regulatory structures for the purpose of arms control. Exploring opportunities to expand arms control measures to space is especially important given the impact of emerging technologies on nuclear command, control and communications (NC3).

Space is married to nuclear weapons through satellite operations, and creative approaches to nuclear arms control could provide solutions for increased contestation and risk in this domain. Military and government systems reliant on space infrastructure are increasingly vulnerable to anti-satellite weapons (ASAT), and it is cheaper to attack than to defend a satellite. Military and government satellite operations could impact or threaten nuclear escalation when NC3, missile detection, and tracking accuracy are unreliable. While reliance on space assets will only increase as launch costs and other barriers to development are driven down, the number of assets in orbit will produce increasing risk for government and military operations if their use remains unregulated in a congested and competitive environment. Assessments of intent and the ambiguities of anti-satellite weapon attribution will continue to puzzle the security policymakers as satellite spoofing, jamming and ASATs only increase presence.33A failure of the nuclear policy interlocutors to include space operations in approaches to non-proliferation and arms control would therefore have grave consequences.

Similarly, artificial intelligence (AI) has begun to influence deterrence relationships between NWS and will have long-term implications for arms control.34 As AI is introduced in NC3 and becomes vulnerable to errors and hacking, it can lead to accidental nuclear escalation. The integration of AI into military platforms exacerbates concerns about its misuse and furnishes states with opportunities to mitigate relative regional imbalances or weaknesses in their capabilities. Such dynamics have been evident in terms of nuclear balancing, where asymmetry in power and conventional capabilities has led to more assertive strategic posture and even nuclear weapons acquisition. These dynamics are also expected to play a role in the development of AI algorithms that interact with conventional and nuclear platforms in the future.35 On the other hand, AI-enabled systems, such as ISR (see footnote 2), can be used to verify treaties and monitor compliance with nuclear forces, increasing transparency among nuclear-armed states. For this purpose, the information obtained would need to be shared among the nuclear powers which must consensually release data on their nuclear forces.36 The realisation of such an approach would be more feasible when

³³ Satellite jamming, whether co-orbital crosslink, uplink, or downlink, can degrade, disrupt, or destroy a satellite without making physical contact by interfering with the satellite signal; this activity is classified as a non-kinetic weapon. Satellite spoofing causes the receiver to lie with a false signal sent to the ground station; for example, ships can be lured off-course with spoofing.

The four types of nuclear force-related applications of AI are: (a) nuclear weapons, (b) increased intelligence on enemy nuclear forces, surveillance and reconnaissance (ISR), (c) nuclear command, control and communication (NC3) and (d) conventional weapon systems relevant to nuclear forces.

³⁵ SIPRI. The Impact of Artificial Intelligence on Strategic Stability and Nuclear Risk. Volume II ed., Lora Saalman, 2019, pp. 3-4.

³⁶ Geist, Edward, Lohn, Andrew, J. How Might Artificial Intelligence Affect the Risk of Nuclear War?. (Santa Monica: RAND Corporation), p. 6

accompanied by traditional confidence-building measures (CBMs) that would shore up the credibility of affected states.

Emerging technologies have further expanded the potential applications for the monitoring and verification of arms control agreements. Civil society actors increasingly use publicly and commercially available sources of information such as remote sensing to scrutinise weapons of mass destruction agreement compliance. The inclusion of societal verification measures in future arms control agreements, including feedback mechanisms for open-source verification, may help states achieve a more detailed picture of treaty compliance in a transparent, democratised way. While open-source tools will not replace national technical means (NTM) and other traditional verification measures, they will play a valuable supporting role.

Establishing an Arms Control Agenda for 2050

Arms control has long been centred on the principles of parity and reciprocity. While these principles remain important, focusing efforts purely in this space might not prove effective in building an arms control framework that adequately addresses contemporary and future challenges to strategic stability. Deemed by some as a relic of the Cold War period, the arms control architecture needs to evolve and can no longer be limited to quantitative reductions to nuclear warheads and delivery systems. Instead, future diplomatic efforts and negotiations will have to adopt a comprehensive approach that includes both quantitative and qualitative targets. The latter will become particularly important in light of changing and emerging technologies that are expected to challenge the contemporary notion of strategic stability and blur the line between the nuclear and conventional realms. Expanding future arms control efforts to include nuclear armed states – beyond the P5 members – as well as opening ways for non-nuclear weapon states (NNWS) to actively feed into P5 discussions will be equally important to rebuild confidence and achieve progress reductions in nuclear risk.

Realizing our vision of a **multilateral**, **flexible**, **and asymmetric arms control architecture** will not be possible without **political commitment** and buy-in from NWS and other relevant stakeholders. To make progress towards establishing a more inclusive framework, finding new ways of engagement and participation for all nuclear armed states, NNWS, and representatives from civil society will be crucial. The following recommendations ensure a "soft and phased" approach towards arms control which builds on initial dialogue among NWS and NNWS and can further be shaped into legal commitments, tangible reductions, and improved international security.

To address the deterioration of trust in arms control and lack of dialogue among NWS and between NWS and NNWS:

- Nuclear weapon states should establish a formal, sustained, and transparent dialogue to discuss nuclear capabilities, doctrines and confidence-building measures to reduce strategic reliance on nuclear weapons and mitigate nuclear risk. The P5 should lead this dialogue, and discussions should follow a concrete work plan and a commitment to regular reporting on progress must be made. As part of this dialogue, all participants should reaffirm the Reagan-Gorbachev formulation that "a nuclear war cannot be won and must never be fought", recognizing their unique responsibility to ensure nuclear weapons are never used again.
- The P5 must establish concrete, sustainable, and regular engagements with NNWS and civil society representatives to expand and strengthen strategic stability discussions. To prevent recurring noncompliance with future treaty obligations and joint commitments, states could further establish a dispute resolution mechanism through which affected regional groups and individual countries could serve as mediators between conflicting parties.
- States must lead the immediate creation of collaborative approaches to verification that can be used for future arms control treaties. These verification methods should build on the cooperation between

NWS and NNWS while ensuring conformity with Article I and Article II obligations under the NPT, such that NNWS would not gain access to information that would allow them to develop nuclear weapons themselves. Additionally, increasingly sophisticated commercial technology makes open-source verification a promising new avenue for verification. States should therefore engage in early cross-sectoral discussions on how to address some of the challenges related to crowd-sourcing methods in the realm of arms control, such as how to effectively validate data and protect the identities of participants.

The "one size fits all" approach is no longer relevant for future arms control agreements, which is why:

- We support the **pursuit of asymmetric arms control measures that adopt common goals but differentiated approaches.** Developing tailored paths to establish a more flexible global arms control framework would allow for the inclusion of both quantitative and qualitative targets. Setting concrete proportionality targets will bring other NWS on board while elevating the issue of the disproportionate arsenal sizes of Russia and the United States.
- We recommend the creation of "gift baskets" similar to those successfully used during the Nuclear Security Summits to achieve progress in arms control. Such an approach would entail voluntary commitments - made outside of the formal arms control architecture - to strengthen arms control. These could take the form of a high-level commitment by the P5 to the pursuit of arms control, regional discussions towards confidence and security building measures among NWS, individual or joint affirmations to exercise restraint in rhetoric and military postures, the establishment of pathways for crisis communication, and other measures.
- To address the changing strategic environment, we propose to establish working groups among NWS and NNWS based on regional dynamics, thematic areas (such as emerging technologies or crisis management measures), verification and other specialized interests.

The impact of emerging technologies on strategic stability is expected to be significant and deserves particular attention.

• Large space powers should spearhead an agreement banning operations that could undermine or damage NC3. Discussions could centre on technology regulation and the correlation between unregulated technology, misperception and escalation.

Conclusion

Arms control, at its core, rests on the recognition of shared humanity as a means to balance national interests and political divisions with the need for diplomacy and de-escalation. While the security environment is now different to that of the Cold War, the fundamental goals remain the same: to avoid an arms race and to reduce the risk of using nuclear weapons. This policy paper recognises the need for flexibility in achieving the enduring relevance of the arms control architecture as diverse actors enter an ever-shifting landscape. It proposes a set of modest confidence-building and risk reduction steps while maintaining an ambitious long-term strategic vision for a flexible, inclusive, and forward-looking multilateral arms control framework.



Closing the NPT-TPNW Gap: What Can NATO Umbrella States Do?

The Disarmament Working Group

Authors: Claudine Bailey, Sweta Basak, Nour Eid, Jahee Kim, Eleanor Krabill, Hannah Kuriakose, Maria Garzón Maceda, Malinda Meegoda, Lucia Madero Murillo, Gayathri Nagasubramaniam, Orion Noda, Marzhan Nurzhan, Jasmine Owens, Andhika Prawira, Dylan Solden, Ian Fleming Zhou

This paper makes the case for North Atlantic Treaty allies under the nuclear umbrella to rethink their position regarding the Treaty on the Prohibition of Nuclear Weapons (the TPNW). It examines the concerns that NATO states often raise concerning the TPNW, particularly regarding its relationship with the Nuclear Non-Proliferation Treaty (the NPT), the instrument widely regarded as the nuclear regime's cornerstone. The paper makes recommendations to enable NATO's non-nuclear weapons states (NNWS) to overcome or mitigate those concerns, and proposes a range of bridge-building actions to help close the growing gap in the international community between TPNW signatories and nuclear allies.

It is crucial that NATO NNWS take such steps. Since the first NPT Review Conference, non-nuclear weapon states —including NATO members— have voiced their dissatisfaction with the pace of disarmament; the TPNW's entry into force can be seen as a direct result of that. Status quo policies have proved ineffective for significant disarmament, while entrenched positions and heated rhetoric threaten the success of the

upcoming Tenth NPT Review Conference. An irreversible erosion of the nuclear regime is possible, an outcome which would be in no one's interest.

NATO NNWS are in a special position to undertake bridge-building activities, being well-placed to broker dialogue between their nuclear allies and the growing international community supportive of the TPNW. However, NATO countries —individually and collectively— have not been supportive of the treaty to date, stating that it is not only incompatible with the NPT but that it also undermines that instrument's legitimacy and aims.

That narrative of incompatibility has been challenged as inaccurate.³² The TPNW was carefully crafted to build upon and strengthen the NPT's disarmament provisions, making it a vital part of the nuclear regime, and one that is here to stay. Therefore, NATO states must rise to the occasion and engage with the TPNW pragmatically, assuming their responsibility under the NPT regime to advance meaningful dialogue and cooperation on disarmament.

The next three sections examine common concerns about the TPNW around deterrence, legal compatibility with the NPT and the verification framework, offering recommendations on how to move forward in a constructive way.

Fundamental concerns: deterrence versus humanitarian arguments

The fundamental schism regarding the TPNW is grounded in the maintenance of opposing rationales on either side. Nuclear weapons constitute to a large extent NATO's strategic security, providing allies with a deterrent capability.³³ However, neither nuclear deterrence nor nuclear weapons are mentioned in the North Atlantic Treaty.³⁴ NATO's current nuclear policy relies on the 2010 Strategic Concept and the 2012 Deterrence and Defence Posture Review. The former commits allies to the creation of conditions favourable to disarmament, while asserting that as long as nuclear weapons exist, NATO will remain a nuclear alliance. Nevertheless, this "balancing act" approach has lost credibility as NATO's words and actions have been recently skewed towards deterrence.³⁵

The nuclear deterrence NATO relies on faces increasing challenges. First, it provides only a 'negative power' through a security dilemma. As nuclear armed states continuously need to prove their readiness to deploy nuclear weapons, they are viewed as threatening by adversaries, triggering balancing and heightening their populations' vulnerability to a nuclear attack in case of conflict escalation.³⁶ Second, the growing pace of technological change in the nuclear military-industrial complex creates uncertainty and instability, weakening deterrence itself. Third, the shift from a bipolar to a complex multipolar world, with multiple

- 35 Łukasz Kulesa, "Restoring the Balancing Act: Disarmament and Deterrence in the New Era," in Europe's Evolving Deterrence Discourse, eds. Amelia Morgan and Anna Péczeli, Center for Global Security Research Occasional Paper, https://cgsr.llnl.gov/content/assets/docs/CGSR_euro_det_final.pdf.
- 36 Benoît Pelopidas, "Having the bomb'- Rethinking power in a context of global nuclear vulnerability," CERISCOPE Power, 2013, http://ceriscope.sciences- po.fr/puissance/content/part1/avoir-la-bombe-repenserla-puissance-dans-un-contexte-de-vulnerabilite-nucleaire-globale.

Thomas Hainoczi, "The Relationship between the NPT and the TPNW," Journal for Peace and Nuclear Disarmament 3, no.1 (2020): 87-91.

³³ Rose Gottemoeller and Steven Hill, "NATO's Current And Future Support For Arms Control, Disarmament And Non-Proliferation", IAI Papers 20, no. 45, 2020, https://www.iai.it/sites/default/files/iaip2045.pdf.

³⁴ Steven Hill, "02 NATO nuclear policy," 2021, accessed March 12 2021, https://www.chathamhouse. org/2021/01/nato-and-treaty-prohibition-nuclear-weapons/02-nato-nuclear-policy

nuclear weapon states that hold different views and alliances, adds another component of instability. Nuclear deterrence, thus, should not be considered to be a reliable basis for state security.

Taking this unreliability into consideration, the TPNW emphasises humanitarian drivers for disarmament. A humanitarian framing removes barriers to diplomatic action by delegitimizing nuclear weapons' value and prestige, and asserting the unacceptability of the harm they cause on legal, moral and political grounds. The TPNW thus supplements the current nuclear regime by providing the missing legal framework that prevents and remediates the human suffering caused by these indiscriminate weapons.

It is worth remembering that many NATO NNWS face growing domestic pressure from public opinion favouring their accession to the TPNW.³⁷ Already, over fifty former governmental leaders from NATO member-states have supported the treaty.³⁸ Moreover, as the TPNW prohibits investments in nuclear weapons manufacturing, NATO NNWS could utilise the opportunity to make sure taxpayers' money and other investments from their country are allocated to healthcare, education, and other social development activities rather than to nuclear weapons manufacturing.³⁹

NATO NNWS are not ready to dismiss their nuclear deterrent rationale, but they can still take steps to rebalance their strategy in support of disarmament.

Recommendations

- NATO NNWS states should recognize the TPNW as part of the larger nuclear disarmament framework and participate as observers in the upcoming Meeting of States Parties to the TPNW. Progressing nuclear disarmament in light of the unacceptable harm caused by nuclear weapons requires all states to further the normative implications of the TPNW through discursive recognition. By participating as observers in its meetings, they will show willingness to engage in diplomatic dialogue.
- NATO NNWS states should refrain from blocking references to the TPNW in the outcome document of the Tenth NPT Review Conference. In doing so, they avoid circumventing the will of the many States Parties traditionally excluded from influencing outcomes. Maintaining the narrative that the TPNW undermines the NPT will only lead to growing frustrations, further entrenching divides and stymying progress on disarmament overall. As the TPNW has now entered into force, it ought to be recognised as part of international law.
- NATO NNWS must call to halt investments in nuclear arsenals and redirect funds towards remediation. Financial institutions and other organisations in these countries should immediately halt investments in modernisation and development of their allies' nuclear arsenals and capabilities. States should redirect funds to the remediation actions stipulated under the TPNW, whether they intend to become States Parties or not. This will show commitment to disarmament and humanitarian efforts, and appropriately recognise all victims.

Legal concerns: compatibility between the NPT and TPNW

International Campaign to Abolish Nuclear Weapons (ICAN), "NATO Public Opinion on Nuclear Weapons,"
2021, last modified April 5, 2021, https://www.icanw.org/nato_poll_2021.

³⁸ R Gladstone, "Former World Leaders Urge Ratification of Nuclear Arms Ban Treaty". The New York Times, September 20, 2020, https://www.nytimes.com/2020/09/20/world/treaty-nuclear-arms-united-nations.html.

³⁹ International Campaign to Abolish Nuclear Weapons (ICAN) and PAX, "Producing mass destruction: Private companies and the nuclear weapons industry," *Don't Bank the Bomb Report*, 2019, accessed April 5, 2021, https://www.dontbankonthebomb.com/2019_producers-report-final/.

A second set of arguments NATO allies raise in critique of the TPNW focuses on its legal incompatibility with the NPT.

The NPT regime supports an integrated system of treaties underpinning its three pillars of disarmament, peaceful uses of nuclear technology and non-proliferation. For example, NPT Article VII allows states to conclude regional treaties for Nuclear Weapon Free Zones, potentially facilitating progress towards both non-proliferation and disarmament. The obligations laid out in NPT Article VI to engage in negotiations that will lead to disarmament also require additional instruments for implementation. The TPNW is an ideal addition to that legal architecture, representing a concrete step towards fulfilling Article VI. It seeks to reinforce the Article by unequivocally promoting and fast-tracking nuclear disarmament and plugging the NPT's unjustifiable "legal gap" that allows some states to maintain their nuclear weapons indefinitely.

It is important to note that the TPNW does not preclude NPT membership for States Parties. It makes clear that existing obligations under the NPT are neither nullified nor relativised by accession to the TPNW.⁴⁰ Rather, the TPNW adds immediate disarmament obligations for states parties, acknowledging the lack of progress to date.

The TPNW expressly supports the "full and effective implementation" of the NPT, which it describes as the "cornerstone of the nuclear disarmament and non-proliferation regime."⁴¹ It thus acknowledges the significance and primacy of the NPT. Moreover, that primacy —given the complementarity between the instruments— is in fact in no way challenged by TPNW Article 18, in either a textual or spiritual sense, as a common line of critique inaccurately suggests. Instead, Article 18 affirms and entrenches complementary and the mutual reinforcement of instruments promoting disarmament.

Thus, the treaties are neither incompatible nor in conflict. Rather, the TPNW advances the disarmament regime in support of the NPT, and constitutes a significant step in achieving a world free of nuclear weapons. There is, however, room for NATO NNWS to enhance dialogue concerning the role of the TPNW in disarmament, and clarify their legal concerns regarding the manner in which the NPT and the TPNW interact.

Recommendations

- NATO NNWS should promote a forum to increase dialogue on legal concerns with TPNW leaders. NATO members should help revive or create a forum similar to the Nuclear Security Summits from 2010-2016. This forum must include a dedicated workstream investigating the compatibility of the TPNW and the NPT, and developing practical methods for streamlining and integrating the agreements into the disarmament work of NATO. The forum would also present an opportunity to capitalise on the Humanitarian Initiative, share victims' testimonies, promote intergenerational dialogue, and include elected officials, academia and civil society.
- NATO NNWS should further involve their legislative bodies in exploring legal arguments challenging the TPNW. Countries could follow the examples of Germany or the Netherlands, where legislative bodies have investigated or mandated a further exploration of TPNW legal compatibility.42 This discussion in

⁴⁰ German Parliament, "Report on the Legal Relationship between

the Treaty on the Prohibition of Nuclear Weapons and the Non-Proliferation Treaty," 19 Jan. 2021.

⁴¹ United Nations General Assembly (UNGA), Text of the Treaty on the Prohibition of the Nuclear Weapons, accessed April 5, 2021, http://undocs.org/A/CONF.229/2017/8.

⁴² International Campaign to Abolish Nuclear Weapons (ICAN), "New cross-party working group to support TPNW in German Parliament," September 2019, accessed April 5, 2021, https://www.icanw.org/new_cross_ party_working_group_to_support_tpnw_in_german_parliament;

public forums contributes to increasing democracy and transparency in the formulation of public policies.

• NATO NNWS should start crafting interpretative declarations to the TPNW. States could draft their declarations in advance so as to be prepared if and when ready to accede to the treaty. These interpretative declarations could respond to language that appears ambiguous and/or incompatible with their existing obligations, so long as the declarations are not in principle reservations and do not operate to defeat the object and purpose of the treaty

Verification concerns: appropriateness of the TPNW framework

A third set of arguments promulgated in critique of the TPNW concern its verification framework.

Regarding non-proliferation, the TPNW reinforces the significance of the International Atomic Energy Agency (IAEA) and mandates the implementation by every state party of a comprehensive safeguards agreement, establishing concrete temporal limits to do so. However, the treaty's critics point out that it did not make the IAEA Additional Protocol a mandatory component of these safeguards agreements. Since it remains a voluntary measure under the NPT as well, this does not demonstrate a lack of compatibility or undermining of the NPT. It rather shows that the TPNW authors (like the NPT members) had to settle on what was already agreed by all states as a minimum common standard.

When it comes to disarmament, critics of the TPNW dwell on the fact that it does not contain any specific measures to ensure a verified and irreversible elimination of nuclear weapons. Without doubt, the inclusion of robust verification elements in any prohibition treaty is crucial to maintaining its effectiveness. Nonetheless, the TPNW could not and would not impose any measures. It leaves the development of a verification regime for a future when nuclear armed states are ready to engage in such discussions, most likely through follow-on agreements undertaken in equitable settings between one or several nuclear armed states.

Article 4 of the TPNW offers two pathways for the verification of disarmament, depending on the state's disarmament status on joining. This is subject to verification under a "competent international authority", over which planning and dialogue continue. The IAEA is the most suitable choice here, but to take on this role its mandate needs to be modified first by its member states. These deliberations have to include both parties and non-parties to the TPNW, highlighting the need for a coordinated approach.

There are initiatives that can inform the TPNW's disarmament verification regime. These incorporate the political and technical expertise of both nuclear and non-nuclear weapon states, producing tangible results in terms of procedure and confidence-building.⁴³ They could include the Quad Initiative, the International Partnership for Nuclear Disarmament Verification (IPNDV), UNIDIR's ongoing TPNW verification project, and the UN Group of Governmental Experts on Verification.⁴⁴

44 Corey Hinderstein, "International Partnership for Nuclear Disarmament Verification: Laying a Foundation for Future Arms Reductions."
Bulletin of the Atomic Scientists 74, no. 5 (2018): 305–11;
International Partnership on Nuclear Disarmament Verification, "Phase I Summary Report: Creating the Verification Building Blocks for
Future Nuclear Disarmament," 2017, accessed April 5, 2021, https://www/ipndv.org/wp-content.uploads/2017/12/IPNDV-Phase-1 Summary-Report_Final.pdf; United Nations General Assembly, "Final Report of the Group of Governmental Experts to Consider the Role of

Susi Snyder, "Dutch Government: Only politics stands in the way of joining the TPNW," March 8, 2019, https:// nonukes.nl/dutch-government-only-politics-stands-in-the-way-of-joining-the-tpnw/.

⁴³ QNVP, "Considerations on the role of verification in advancing nuclear disarmament: background paper." Retrieved April 5, 2021, https:// undocs.org/pds?symbol+en/GE-NDV/2018/4; Laura Rockwood and Thomas E. Shea, "Nuclear Disarmament: The Legacy of the Trilateral Initiative," *Deep Cuts Working Paper*, no. 4 (March 23, 2015), https://d-nb.info/1069519111/34.

A non-proliferation and disarmament verification regime is in the making, and requires cooperation. It is in the interest of NATO NNWS to actively participate in shaping it.

Recommendations

- NATO NNWS should continue their outreach efforts on safeguards. These activities should raise awareness about the importance attached to the universal adoption of the IAEA Additional Protocol, at the same time as considering the underlying reasons explaining why some NPT and TPNW States Parties have yet to accept them.
- NATO NNWS should continue participating actively in current multilateral verification initiatives. Combined exercises including both TPNW members and nuclear armed states serve as confidencebuilding measures and contribute to a common understanding of the possible future implementation of multilateral verification efforts under the TPNW.
- NATO NNWS should support further disarmament verification initiatives as bridge-builders. Based on the assessment of previous disarmament verification initiatives, multiple smaller initiatives, with tailored and equitable membership of working groups, might be better fitted to implement exercises and produce tangible results. Acting as a bridge-building party to increase transparency and accountability, NATO NNWS could mend relations with nuclear-armed states for future verification efforts under the TPNW.

Conclusion

As the TPNW is now a reality, states should not engage in futile debates nor dismiss each other's concerns, but embrace and capitalise on the momentum that it has created to progress nuclear disarmament. NATO umbrella states can be bridge-builders and need to discuss these issues not only in Geneva, New York and Vienna but also with allies in Brussels, working to restore credibility in their disarmament commitments among the TPNW supporters.

A few NATO NNWS have made good efforts and already taken steps in that direction, an example that could be followed by other states in the alliance. The first concrete step they could take would be to moderate their critical rhetoric and engage more closely with debates regarding the humanitarian and environmental consequences of nuclear weapons, as well as their opportunity costs. This policy paper recommends a range of further actions to take in the short and medium term:

- **To rebalance their commitments towards disarmament**: recognise the TPNW as part of the larger nuclear disarmament framework; participate as observers in the upcoming Meeting of States Parties to the TPNW; refrain from blocking references to the TPNW in the NPT Review Conference; call on halting investments in nuclear arsenals; and redirect funds towards remediation.
- To curb their legal concerns on the compatibility of the NPT and the TPNW: promote a forum to increase dialogue on legal issues; further involve their legislative bodies in exploring legal arguments to the TPNW; and start crafting interpretative declarations to the TPNW.
- **To build a suitable non-proliferation and disarmament verification regime:** continue their outreach efforts about safeguards; continue participating actively in current multilateral verification initiatives; and support further disarmament verification initiatives as bridge-builders.