

# Fit for Purpose: An Evolutionary Strategy for the Implementation and Verification of the Treaty on the Prohibition of Nuclear Weapons

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## ABSTRACT

The Treaty on the Prohibition of Nuclear Weapons requires States Parties to designate a “competent international authority or authorities” for negotiating and verifying the irreversible elimination of nuclear-weapons programs. Ensuring that such an authority or authorities is able to be fit for purpose when required to meet these tasks will be crucial for both the future implementation and legitimacy of the Treaty. To address this challenge, this article proposes the early creation of a two-part organizational structure, comprising an implementation support unit and a dedicated scientific and technical advisory body, to begin the process of institutionalizing the treaty, and build the technical basis for meeting its verification goals should a nuclear-weapon-possessing state decide to join. The article then discusses how such two-part structure could be scaled-up as a standing international organization tasked with the coordination of an ad hoc inspectorate, which would also cooperate and complement the work of existing nuclear verification organizations, such as the International Atomic Energy Agency. This evolutionary and adaptive strategy to institution building could empower the new Treaty by supporting the emergence of a new regime complex for nuclear disarmament, while taking into account the initially limited financial and technical resources of its member states.

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## Introduction

On 7 July 2017, one hundred and twenty-two states voted at the United Nations to adopt a Treaty on the Prohibition of Nuclear Weapons (TPNW). The Treaty binds its signatories to never develop, acquire, threaten to use, use, or stockpile nuclear weapons, with the goal of making such prohibitions universal (TPNW, Article 1). The Treaty, now open for signature, will enter into force after the fiftieth ratification. Member states, observers, and civil society supporters will then gather within a year to take part in the first Meeting of the State Parties (MSP). At this meeting,

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member states will start taking important decisions that will affect the long-term implementation and institutionalization of the TPNW.

One key decision will concern how TPNW states organize to conduct the verification of nuclear disarmament should a nuclear weapon state seek to join the Treaty.<sup>1</sup> In particular, TPNW states will need to fulfill the Article 4 requirement to “designate a competent international authority or authorities to negotiate and verify the irreversible elimination of nuclear-weapons programmes, including the elimination or irreversible conversion of all nuclear weapons-related facilities,” on their behalf (TPNW, Article 4(6)). Some of the specific tasks involved were outlined by Elayne Whyte Gómez the President of the TPNW negotiating conference as including “matters which by necessity can only be agreed directly with the States possessing nuclear weapons. This includes matters like the items to be declared, provisions for on-site inspections, establishment of necessary institutional arrangements, schedules and timeframes for elimination, compliance and enforcement, and interim measures pending the complete elimination of nuclear weapon programmes” (Gómez 2017). The process of designating a TPNW authority or authorities and ensuring it is able to be fit for purpose when required to meet these demands will be crucial for both the future implementation and legitimacy of the Treaty.

In order to meet these requirements and further the institutionalization of the TPNW, this article proposes a novel approach of the early establishment of an Implementation Support Unit (ISU) and a Scientific and Technical Advisory Board (SAB). ISUs have typically accompanied treaties without designated verification bodies, whereas SABs have accompanied treaties with complex verification requirements. The authors argue that the unique combination of both entities suits the requirements and broader goals of the TPNW while keeping costs to States Parties low.

To implement the verification provisions of the TPNW, member states will need to establish relations with existing instruments and organizations, a function that could be carried out by the TPNW ISU. This could contribute to the diffusion of the Treaty principles by encouraging these organizations to discuss and decide on possible contributions to the implementation of the TPNW. This process will need TPNW states to carefully balance relations with established treaties and institutions while avoiding constraints due to existing instruments and hierarchies which shape relations between nuclear weapon states and non-nuclear weapon states (Mian 2004; Walker 2012). The work of embedding the TPNW is likely to be contested – at least at the beginning – by nuclear weapon states that have been absent from or even opposed to the TPNW negotiations and have a predominant if not determining role in the governance structure of existing institutions (Fisher 1997; Shea 2018; Ritchie 2019).

The literature on regime shifting (Helfer 2004), contested multilateralism (Morse and Keohane 2014), and regime complexity (Alter and Meunier 2009; Alter and Raustiala 2018) suggests a course of action permitting strengthening the disarmament regime through the TPNW despite possible nuclear weapon states’ opposition. Ironically, this initial nuclear weapon state opposition to the TPNW over time may serve to strengthen

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<sup>1</sup>Since the TPNW does not use the term “nuclear-weapon state,” which is an artifact of the Nuclear Non-Proliferation Treaty, in this article the terms nuclear-weapon state and nuclear-armed state are used interchangeably to describe a state that owns, possesses or controls nuclear weapons, or did so after 7 July 2017, and would have obligations under Article 4 of the TPNW.

both the treaty and the disarmament regime (Petrova 2019). This involves TPNW member states creating new institutional elements to develop, advance and entrench treaty goals, policies and practices, which would complement existing instruments and structures, encourage innovation, and increase the likelihood of identifying possible implementation and verification challenges and finding solutions by the time they may be needed. A TPNW SAB would enable substantive work toward this end.

After reviewing what existing monitoring organizations can do for the implementation of the TPNW, this article proposes and details the creation of a new two-part organizational structure, consisting of an ISU and SAB, tasked with supporting the implementation of the treaty and advancing the development and realization of its disarmament verification provisions. Finally, it also provides a roadmap to scale-up this structure to a standing and capable international organization, taking into account the limited capabilities and resources currently available to many TPNW states. The approach, arrangements and organizations suggested here could have a role in possible disarmament processes and treaty structures that in the future may incorporate and transcend the TPNW.

## **Implementing and Verifying the TPNW**

The burgeoning literature on the TPNW has so far discussed the Treaty as a normative instrument expressing frustration at the failure of nuclear weapon states to fulfill their disarmament obligations under article 6 of the Non Proliferation Treaty (Sauer and Pretorius 2014; Thakur 2017; Maas 2018; Potter 2017) or as an instrument to “advance international humanitarian law and disarmament law” (Nystuen, Egeland, and Hugo 2018), “delegitimize nuclear-weapon possession” (Gibbons 2018), or challenge the established “hegemonic nuclear order” (Ritchie 2019). Much of this literature tends to treat the TPNW as an isolated instrument, however. A different perspective emerges if the TPNW is seen as embedded in a regime complex landscape of prior treaties, agreements, and institutions that can work for, with, and against the TPNW. The key questions become what relations the TPNW will build with established structures, and how this will affect the ability of the Treaty to advance its own goals, including its universalization to include all states, especially today’s nine nuclear weapon states.

### ***What Can Existing Organizations Do to Support TPNW Verification Provisions?***

The first questions TPNW states representatives will need to answer when thinking about the implementation of the Treaty with regard to nuclear disarmament and nuclear-armed states are: what can existing organizations do to support the verification of the TPNW? What can’t they do? And when they can – what will be needed for them to do it?

The International Atomic Energy Agency (IAEA), created in 1957 as an autonomous body within the United Nations system, is the most obvious international organization that could be designated as the authority for verifying the TPNW (Loghin 2019). Two regional bodies that have similar purposes and approaches to the IAEA (albeit with more limited scope) and now work together with it are the European Atomic Energy

Community (Euratom 1957) and the Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials (ABACC 1991). None of these organizations, however, currently could address all the envisaged disarmament verification goals of the Treaty. These organizations were not created to address disarmament as such, and certainly not in the way envisaged in the TPNW. Their monitoring missions have primarily been focused on civilian fissile material production, stocks and use with a view to preventing diversion for weapon purposes.

The IAEA has some experience with verification related to nuclear weapon programs acquired over the past 30 years, but this effort has remained limited in scope, covering either nascent or renounced programs (Wing and Simpson 2013; Bush & Pilat 2017). It has not included deployed or stored weapons, or dismantlement or destruction of nuclear weapons as such, apart from the U.S.-Russia-IAEA trilateral initiative from 1996 to 2002 on verification of weapon-origin fissile materials (Shea and Rockwood 2015). Most verification concepts applicable to nuclear weapon systems were developed as part of bilateral arms limitation or reduction agreements between the United States and Russia (U.S. National Academy of Sciences 2005), which were designed to limit the size of active nuclear arsenals rather than their elimination.

The IAEA has roles specified in the TPNW, which in principle could serve as a starting point for a broader role. The Treaty requires that all members negotiate and sign a safeguards agreement with the IAEA.<sup>2</sup> Thus, if a nuclear weapon state was to join the TPNW, and perhaps the Non-Proliferation Treaty (NPT) as a non-nuclear weapon state in a parallel process, the IAEA would be the primary organization involved in negotiations to place all existing nuclear material stockpiles under international safeguards; and eventually reach the conclusion that all relevant activities and materials in the state in question are for peaceful use only.

The IAEA Statute allows it to apply safeguards at the request of a state to “any of a State’s activities in the field of atomic energy” or under a relevant bilateral or multilateral arrangement, and the Statute also states that the IAEA should conduct its activities “in conformity with policies of the United Nations furthering the establishment of safeguarded worldwide disarmament and in conformity with any international agreements entered into pursuant to such policies.”<sup>3</sup> An IAEA role in TPNW verification would certainly appear to fit under a reasonable interpretation of this mandate. Important precedents include the IAEA development of safeguards for the NPT member states – although it is worth recalling that it was only “On 6 April 1970, soon after the entry into force of the NPT, [that] the IAEA Board of Governors created a special committee to draw up the safeguards to be applied in the non-nuclear-weapon States that would join the NPT” and it was only in March 1971 that the now standard IAEA Comprehensive Safeguards Agreement, also known as INFCIRC/153, was agreed (IAEA 1998). The IAEA also entered into a safeguards partnership with Euratom countries

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<sup>2</sup>Non-nuclear weapon states must conclude and “bring into force a comprehensive safeguards agreement (INFCIRC/153 (Corrected))” (TPNW, Article 3(2)). A nuclear weapon state joining the Treaty must conclude a safeguards agreement “to provide credible assurance of the non-diversion of declared nuclear material from peaceful nuclear activities and of the absence of undeclared nuclear material or activities in that State Party as a whole” (TPNW, Articles 4(1) and 4(3)). The latter is akin to implementing an arrangement similar the IAEA Additional Protocol (Nystuen, Egeland, and Hugo 2018, 12).

<sup>3</sup>The Statute of the International Atomic Energy Agency, as amended up to 28 December 1989, Article 3, Section A, Paragraph 5; Article 3, Section B, Paragraph 1; Article 9, Section A.

starting after 1973, and is a member of a quadripartite agreement with Brazil, Argentina, and the Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials. The IAEA was not represented at the negotiations leading to the TPNW, however, despite an invitation.<sup>4</sup>

In spite of the legal pathways allowing the IAEA to play a disarmament verification role for the TPNW, there are disarmament verification tasks which the IAEA is currently not set up to accomplish (Shea 2018; Erästö, Komžaitė, and Topychkanov 2019). These include monitoring a broad array of facilities and activities related to nuclear weapon research, development, manufacturing, storage, deployment, maintenance, dismantlement, destruction and disposition. Part of the issue is that the IAEA's verification process is primarily designed for control of the civilian nuclear fuel cycle and for the accounting of fissile materials, whereas the TPNW deals comprehensively with a state's nuclear weapon program – which includes every element of a weapon system and the associated military and technical support structures. The IAEA has as yet not developed systematic procedures for dealing with military facilities, with the few inspections in such facilities being worked out through ad-hoc agreements with the concerned state.<sup>5</sup>

While the IAEA was ultimately able to manage the disarmament verification case of South Africa through a gradual accounting process of its fissile material inventory (Baekmann, Dillon, and Perricos 1995; Purkitt and Burgess 2005; Albright & Stricker 2016), this experience is unlikely to be sufficient for a state with a larger, or much older, or more diverse, or more advanced nuclear weapon program (Mian, Patton, and Glaser 2017), where there will be a greater diversity of facilities and much larger material balance uncertainties (Feiveson et al. 2014; IPFM 2009, 2010). To address this issue, it will be necessary to develop disarmament verification tools such as nuclear archeology – the ability to independently reconstruct past military fissile material production history (Fetter 1993; Wood et al. 2014; Philippe and Glaser 2014). Nuclear archaeology will be key to reducing fissile material inventory uncertainties, and to help confirm the initial report that nuclear weapons would be required to make as part of fulfilling the TPNW obligation to reach a “safeguards agreement with the International Atomic Energy Agency sufficient to provide credible assurance of the non-diversion of declared nuclear material from peaceful nuclear activities and of the absence of undeclared nuclear material or activities in that State Party as a whole.”

Another area of concern is that the IAEA cannot directly handle classified information related to nuclear weapons or weapons-grade fissile material. There has been a long standing effort to develop new verification approaches and equipment such as information barriers that measure classified information but prevent its release (Close, MacArthur, and Nicholas 2001), methods that never measure classified information in the first place (Glaser, Barak, and Goldston 2014; Philippe et al. 2016), or methods that defer measurements until all classified attributes of fissile materials have been

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<sup>4</sup>IAEA Director General, Introductory Statement to the Board of Governors, 12 June 2017, “We have received a letter from the President of the United Nations Conference to Negotiate a Legally Binding Instrument to Prohibit Nuclear Weapons, inviting the Agency to be represented at negotiations in New York starting on June 15th.” <https://www.iaea.org/newscenter/statements/introductory-statement-to-the-board-of-governors-12-june-2017>.

<sup>5</sup>For example, the IAEA had access several times to Iran's Parchin military facility in the years preceding the adoption of the Joint Comprehensive Plan of Action (Rauf and Kelley 2014; Amano 2017).

removed (Podvig and Rogers 2017; Patton and Glaser 2018). So far, when provided with sensitive nuclear weapon related information, the IAEA provides such information only to inspectors from the five NPT nuclear weapon states (U.S., Russia, France, China and Britain) who then analyze and process it. Reliance on such inspectors may not be seen as a problem in the NPT framework since these states are parties to the NPT, along with the non-weapon states, but it could be seen as a problem for TPNW verification. It is possible to imagine that a nuclear-armed state such as North Korea, Israel, India or Pakistan may seek to join the TPNW before some or all of these five NPT nuclear weapons states have become parties to the TPNW. Leaving critical aspects of nuclear disarmament verification in this situation to inspectors from these five states and the IAEA under the NPT process (or a United Nations Security Council authorized process) means the TPNW as an institution would have limited control over managing a core element of its own implementation. This dependence may be used by TPNW skeptics and opponents to challenge its legitimacy and relevance.

At a more fundamental institutional level, it must be recognized that the governance structure and internal decision-making process of the IAEA have been largely shaped and are dominated by the five NPT nuclear weapon states in various ways (Fischer 1997; ElBaradei 2011; Roehrich 2018; Ritchie 2019). There are therefore issues of fairness, legitimacy, and participation (Franck 1998; Buchanan 2007) that would shadow any arrangement where the IAEA were to be designated as the sole authority to negotiate and organize disarmament verification on behalf of TPNW member states. It is of course possible that under political pressure or out of institutional self-interest the IAEA could defer or decline accepting such a designation by the TPNW.

A second body that in principle could contribute to the TPNW disarmament verification process is the Comprehensive Test Ban Treaty Organization (CTBTO) Preparatory Commission. It could assist for instance with developing procedures for verifying the dismantlement of nuclear weapon testing facilities and capabilities and for conducting forensic fissile material and radiological analysis at nuclear weapon test sites to ensure weapons declared as having been explosively tested were as claimed. The CTBTO could also provide technical support with the TPNW's positive obligations to assist victims of the use or testing of nuclear weapons and undertake environmental remediation of areas contaminated by such use or testing. Such support could fall under the Comprehensive Test Ban Treaty permission to the CTBTO to make "cooperative arrangements with other international organizations" and the right under this treaty for States Parties to "consult, directly among themselves, or through the CTBTO or other appropriate international procedures, including procedures within the framework of the United Nations, on any matter relating to the object and purpose of the CTBT".<sup>6</sup> Even though the treaty is not in force, the Preparatory Commission has standing as an international organization, and has been given the authority by its signatories to negotiate and enter into agreements (CTBT 1996b).

The TPNW process is not alone in recognizing the need for additional work on specific nuclear disarmament verification approaches, instruments and methods: the treaty specifies only a process and a goal for disarmament verification. Article 4(1) calls a state to "cooperate with the competent international authority . . . for the purpose of verifying the

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<sup>6</sup>Comprehensive Test Ban Treaty (1996a), Article II, Section A, Paragraph 8; Article II, Section A, Paragraph 5.

irreversible elimination of its nuclear-weapon programme” and Article 4(2) calls for a state’s “time-bound plan for the verified and irreversible elimination of that State Party’s nuclear-weapon programme, including the elimination or irreversible conversion of all nuclear-weapons related facilities” to be “negotiated with the competent international authority.” Two key intergovernmental initiatives whose mission is to explore nuclear disarmament verification challenges also suggest there is work to be done.

The International Partnership on Nuclear Disarmament Verification (IPNDV), launched in 2015 by the United States and involving 25 countries, concluded in 2017 that “multilaterally monitored nuclear warhead dismantlement” was “possible” and proposed in its second phase to “address the verification challenges that arise . . . both prior to and following the dismantlement of a nuclear weapon” (IPNDV 2017a). This involves plans to focus on “verification related to declarations and inventories; nuclear arms reductions; and technologies for verification” (IPNDV 2017b). The second initiative involves a group of governmental experts (GGE) from 25 countries that met in 2018 and 2019 following United Nations General Assembly resolution 71/67 (December 2016) “to identify and develop practical and effective disarmament verification measures facilitating the objective of achieving and maintaining a world without nuclear weapons through, inter alia, advancing, understanding and addressing technical challenges of nuclear disarmament verification and monitoring, including tools, solutions and methods and capacity-building” and for “the development and strengthening of practical and effective nuclear disarmament verification measures, which will build confidence and facilitate the advancement of nuclear disarmament efforts” (General Assembly 2016). Both initiatives clearly reflect an underlying perceived need for an active disarmament verification agenda and mechanisms to pursue it. TPNW states will need to find ways to arrive at their own judgment on these verification issues as they bear on treaty goals, obligations and implementation.

### ***Scope for a New Organization Tasked with TPNW Verification and Implementation***

Recognizing the possible limits of relying solely on the IAEA and other existing organizations for the verification of the TPNW suggests there is value in considering the benefits of the creation of a new body through the TPNW diplomatic process to support treaty implementation and verification efforts. This TPNW body would cooperate with the IAEA and other relevant organizations through a division of tasks to leverage existing capabilities, and develop TPNW-specific guidance for realizing the treaty goal of verifying the irreversible elimination of nuclear weapons and nuclear-weapon programs. This approach offers a means for providing guarantees for member states’ effective direction of and participation in the verified disarmament process envisaged under the TPNW.

Since the 1960s, scholars, diplomats, and states (including both the United States and the former Soviet Union) have put forward the idea of a large dedicated organization tasked with the international control of disarmament (Myrdal 1974; Shea 2018; Scheffran 2018). While the establishment of such an organization is appealing, member-states of the TPNW would need to commit heavily to establish the technical legitimacy,

political capital, and financing for a major international organization to carry out such a critical global task. The approach described below aims to reflect these constraints by offering an evolutionary approach that involves setting up a small and flexible two-part structure that would focus on the implementation of the Treaty and anchor the development of TPNW-specific guidance on nuclear disarmament verification goals, principles and methods.

The new organization would have four core missions: The first mission would be to support the implementation of the Treaty, which would include establishing and maintaining cooperation agreements with existing organizations such as the IAEA and the CTBTO, but also with member states, for the exchange of information relevant to its mission. The second mission would be to provide scientific and technical advice to member states on the implementation and verification of the Treaty provisions. This would include developing guidance for gathering and processing essential information and historical records (Philippe, Glaser, and Felten 2019), as well as verifying the removal of weapons from alert status, the destruction of existing weapon systems, the declaration of military fissile material stocks and their disposal, and the elimination or conversion of all nuclear-weapons-related infrastructures (Mian, Patton, and Glaser 2017). The third mission would be to review and negotiate the time-bound and verifiable plan for the irreversible elimination of a new nuclear-armed state's nuclear-weapon programme on behalf of the State Parties. The fourth mission would be to provide support for organizing an ad-hoc inspectorate in the event of a nuclear weapon state joining the treaty. The main benefit of this new structure is that it enables the TPNW to meet its goals and to further the establishment of a more effective and entrenched disarmament regime.

### **Establishing a New Organization Using an Evolutionary Adaptive Approach**

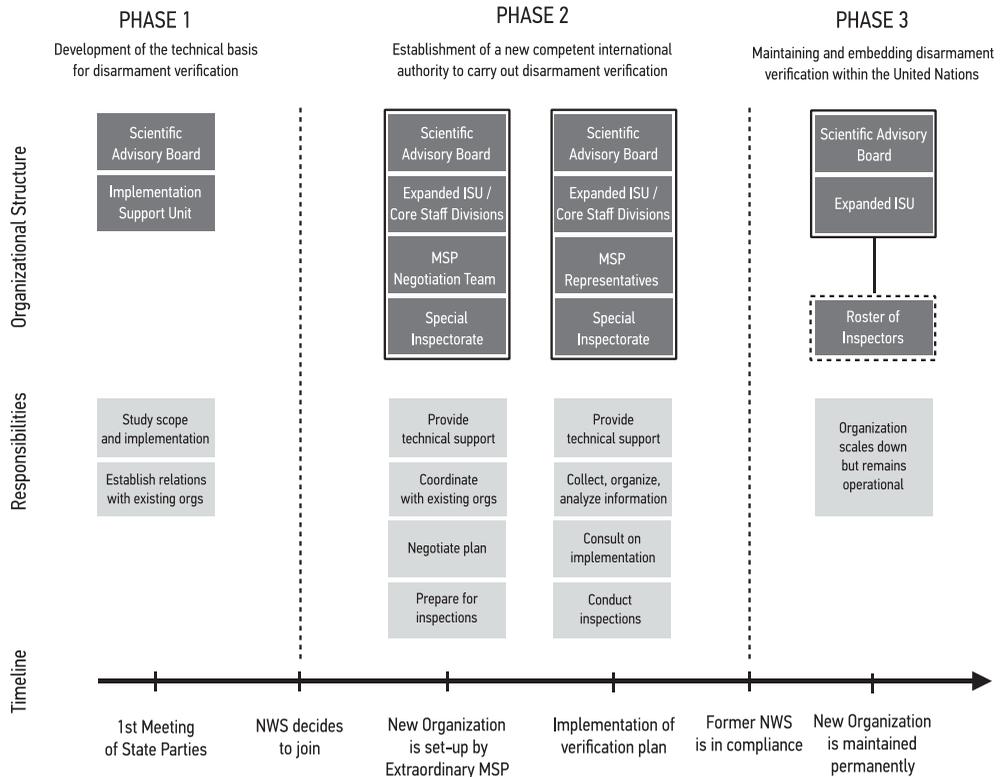
The institutional structure for a new international authority under the TPNW could be built over time in a three-phase evolutionary approach that would adapt to emerging circumstances affecting the treaty (summarized in [Figure 1](#)):

Phase 1: Institutionalizing the TPNW and building the technical basis for meeting its disarmament verification goals

Phase 2: Establishing an authority to manage disarmament verification

Phase 3: Embedding disarmament verification capabilities within the global regime complex for nuclear weapons

Phase 1 would include the establishment during the first meeting of the State Parties of a TPNW implementation support unit (ISU) and a scientific and technical advisory board (SAB). The ISU would provide a focal point for engagement with states and existing international organizations, as well as information management and other activities related to treaty implementation other than verification, while the SAB would help TPNW states begin to build the necessary guidelines and standards upon which a future authority will base its actions.



**Figure 1.** An evolutionary approach to an organization for the treaty on the prohibition of nuclear weapons as the treaty-mandated “competent international authority.”.

Phase 2 would be triggered by a nuclear-weapon-possessing state deciding to join the TPNW.<sup>7</sup> Even prior to the entry into force of the treaty for such a state, the States Parties can establish and designate a new organization that would serve as the international authority to oversee the implementation of Article 4 for the joining state (TPNW, Article 4(6)). This body, referred to here as the Organization for the Treaty on the Prohibition of Nuclear Weapons (or simply, the Organization) would leverage the SAB and ISU structures established in Phase 1, coordinate a diplomatic and technical team to negotiate verification plans with the new State Party, and eventually manage a special inspectorate to carry out TPNW-specific disarmament inspections. The creation and function of this inspectorate would draw on lessons from the United Nations Special Commission (UNSCOM) and the United Nations Monitoring, Verification and Inspection Commission (UNMOVIC), and the IAEA teams that have been involved in verifying the elimination of weaponized nuclear programs.

Phase 3 would begin once the joining state is declared to be in compliance with regards to its obligations under TPNW Article 4. This phase would consist of the Organization transitioning to a standing structure with the goal of assessing lessons

<sup>7</sup>It is possible that two or more nuclear-armed states may agree among themselves to join the TPNW together, in which case the proposed Organization for the Treaty on the Prohibition of Nuclear Weapons will work with the concerned states parties to find an agreed approach that would be acceptable to the TPNW.

from the experience gained in the disarmament verification process, and maintaining and improving skills and capabilities in anticipation of other nuclear-armed states joining the TPNW. Once all of today's nine nuclear armed states have disarmed, the Organization would be the repository of TPNW disarmament verification information and have responsibility to the TPNW states for interpreting the IAEA assessments of the compliance of the former nuclear-armed states with their safeguards obligations.

These three phases are described below in more detail, along with relevant examples and experiences from other treaties and disarmament-related processes.

### ***Phase 1: Institutionalizing the TPNW and Building the Technical Basis for Disarmament Verification***

#### ***Implementation Support Unit***

The first component of Phase 1 is the establishment of an Implementation Support Unit (ISU). This type of body, normally consisting of a few staff members tasked with organizing implementation of the core objectives of a treaty, exists under the Convention on Certain Conventional Weapons, the Biological Weapons Convention, Anti-Personnel Mine Ban Convention, and the Cluster Munitions Convention. All these treaties lack a large standing organization for the work of the treaty analogous to the OPCW and CTBTO for instance – as noted earlier, the IAEA existed and was operating for a decade before the NPT was opened for signature. Existing treaties which have established an ISU provide potential models and lessons for a TPNW-ISU. An ISU stands as an alternative to having the administrative functions of the TPNW entrusted to the UN Office for Disarmament Affairs (UNODA), as is the case with the NPT.

One ISU model, adopted by the Convention on Certain Conventional Weapons CCW and by the Biological Weapons Convention, is to establish the unit within UNODA. Under this model, staff members are UN employees (typically Political Affairs Officers). For the CCW, the ISU consists of two full-time staff members within the Geneva Branch of the UNODA, funded by the States through the estimated costs of CCW meetings. It works under the authority of the annual Meetings of the High Contracting Parties to the Convention, and its duties include: (1) providing administrative support to and preparing documentation for meetings; (2) facilitating communications among High Contracting Parties and with international organizations; (3) serving as a focal point for submission of information; (4) developing and maintaining the CCW website and the CCW databases; (5) supporting the High Contracting Parties, on request, in the implementation of the CCW and assisting the Secretary-General of the United Nations in the discharge of compliance mechanisms; and (6) contributing to the promotion of the universalization of the CCW (Convention on Certain Conventional Weapons, 2009).

A second model for an ISU is followed by the Anti-Personnel Mine Ban Convention and the Cluster Munitions Convention. These conventions host the ISU in an independent organization rather than in the United Nations machinery. This has been done in order to anchor the ISU in a body with substantive technical expertise and as a way to expand the capabilities of the unit in spite of limited resources. For example, under the Anti-Personnel Mine Ban Convention, the ISU is hosted by the Geneva International Center for Humanitarian Demining (GICHD), an expert organization

focused on reducing the impact of mines, cluster munitions and other explosive hazards. GICHD support to the ISU includes human resources, financial and conference management, office space and general logistics, travel services, sponsorship administration, and other support. These support services are funded by Switzerland's core contribution to the GICHD. The ISU of the Cluster Munitions Convention (2018a) also is hosted by GICHD, and in addition, has a mandate to provide technical support and advice to the CMC Presidency and to individual States Parties. This ISU is financed through annual and multi-year contributions made by States Parties. Additionally, States Parties and other stakeholders can make voluntary contributions, either in a financial or in-kind form.

An ISU under the TPNW could follow either of the two models outlined above, and perhaps even combine elements of both approaches in an effort to maximize its effectiveness while minimizing costs to States Parties. One benefit of having an ISU situated within the UNODA is that it could serve to support the strengthening of disarmament as an institutional operating activity of the United Nations. An autonomous ISU hosted by an independent organization could offer a means to bring in additional outside resources, and increase flexibility. One possible location for an autonomous TPNW- ISU would be Vienna, the home of the IAEA.

Under the TPNW, in addition to administrative functions, the ISU would perform the critical duties of:

- (1) Serving as a focal point for engagement between States Parties, with other international organizations such as the IAEA and CTBTO, and with other states toward establishing the universalization of the treaty (required under TPNW Article 12);
- (2) Collecting and organizing information relevant to the implementation of the treaty, such as declarations, information relevant to implementing positive obligations under the treaty, and information related to international cooperation and assistance;
- (3) Coordinating with the Scientific Advisory Board to organize, transmit and present relevant information to States Parties, including at the Meeting of States Parties and on an ad-hoc basis as necessary.

### ***Scientific Advisory Board***

The second component of Phase 1 is the establishment of a Scientific and Technical Advisory Board (SAB). The purpose of the SAB would be to ensure that TPNW states understand possible disarmament challenges involved in implementing the treaty, to develop guidelines and recommendations on disarmament requirements and verification options, and ensure TPNW states are technically prepared to establish an international authority in the event that a nuclear-weapon state elects to join the treaty.

The scientific advisory process has been an essential element of building substance and legitimacy around the implementation process of other treaties, some of which offer useful models for the TPNW. For example, in the negotiations that led to the IAEA Statute or the Chemical Weapons Convention (CWC), the scientific advisory process was critical to refining and directing the implementation of these legal instruments.

In the IAEA context, UN resolution 810(XI) established a Scientific Advisory Committee to advise UN Secretary General Dag Hammarskjöld on the August 1955 UN Conference on the Peaceful Uses of Nuclear Energy. This Committee included representatives of the United States, France, Canada, the United Kingdom, the Soviet Union, Brazil, and India. The “technical talks” while short-lived were an important preface to the formal negotiating process leading to the establishment of the IAEA and centered on the question of which kind of technical safeguards were “feasible and necessary for ensuring that nuclear material for use in reactors can be supplied to members of an International Atomic Energy Agency without increasing the risk to the security of the world” (Roehrllich 2016).

A more relevant and recent model for the TPNW is that of the Organization for the Prohibition of Chemical Weapons’ Scientific Advisory Board (OPCW-SAB), which is a subsidiary body set up to enable the Director-General to render specialized advice in science and technology to the Conference, Executive Council, or States Parties to the Convention. The OPCW-SAB reports to the Director-General, who submits its reports, alongside his own response, to the Executive Council. Every five years, the OPCW-SAB prepares a larger report on developments in science and technology for submission to the Review Conference. On request, the OPCW-SAB provides advice on technical matters related to the implementation of the Convention, including on co-operation and assistance to the Technical Secretariat.

The OPCW-SAB’s membership model and program of work presents a useful reference for the TPNW. The board is composed of 25 independent experts from OPCW member states, each of whom serve in a personal capacity (not as representatives of their respective governments) for up to two consecutive three-year terms. The OPCW-SAB members are appointed by the Director-General in consultation with States Parties from a list of nominees put forward by the States Parties. The OPCW-SAB has the ability to establish and coordinate temporary working groups to draw upon extended expertise for assessment and reporting on specific issues of relevance to the Convention. In its first session, the OPCW-SAB established a temporary working group (TWG) on verification methodologies and emerging technologies, a TWG on on-site monitoring equipment, and a TWG on issues related to the destruction of chemical weapons (OPCW 1998). The same organizational structure is still in use today with working groups developing recommendations in the areas of verification, investigative science and technology, and education and outreach (OPCW 2018).

A similar structure is permitted under the Comprehensive Nuclear-Test-Ban Treaty. Under article II-B.26(f) the Conference of the States Parties “may direct the Director-General to establish a Scientific Advisory Board to enable him or her, in the performance of his or her functions, to render specialized advice in areas of science and technology relevant to this Treaty to the Conference, to the Executive Council or to States Parties” (CTBT 1996a). As with the CWC, this CTBT Scientific Advisory Board “shall be composed of independent experts serving in their individual capacity” to be appointed “in accordance with terms of reference adopted by the Conference, on the basis of their expertise and experience in the particular scientific fields relevant to the implementation of this Treaty” (CTBT 1996a). Since the CTBT has not entered into force, the first session of the Conference of States Parties has yet to be convened and there have been no opportunity to establish its Scientific Advisory Board.

A TPNW-SAB, building on the models of the CWC and CTBT, could be composed of individuals with expertise in scientific and technical areas relevant to nuclear disarmament and verification issues, each of whom could be appointed by any executive decision-making organ as agreed by States Parties. The SAB could be mandated to address core technical implementation issues of the TPNW in order to offer guidance to States Parties including designating a future international authority. The SAB could establish Temporary Working Groups (TWGs) as needed to develop recommendations in greater detail. Possible TWGs for a TPNW-SAB might include:

- (1) Scope and technical standards for irreversible nuclear weapon program elimination
- (2) Nuclear disarmament verification approaches and options
- (3) Technical methods for supporting implementation of TPNW positive obligations

The main benefits of such an SAB are that it will be bound to the TPNW, and provide a means to develop substantive technical guidance for TPNW states decision-making while keeping commitments and costs relatively low. It could initially function without a formal Technical Secretariat, reporting directly to the chair of the TPNW MSP and states could elect to remain financially responsible only for an SAB annual meeting and provide support for TWGs as possible. It also offers a means for the TPNW to engage constructively with existing technical processes on disarmament verification and to counter criticism that the treaty does not give due weight to inevitable verification challenges.

Part of the motive behind this two-part structure of an ISU and a SAB is that it allows for a relatively low-cost means to achieve the goals of implementation and institutionalization discussed in this article. If TPNW states follow the model of the OPCW-SAB, the costs of the TPNW-SAB could be made minimal. Board members are not paid a salary by the OPCW, and are rather supported by their home institutions. The OPCW (2004) took the decision to pay only for travel and per diem costs associated with the annual meeting of the OPCW-SAB. In order to support additional meetings, such as those of the temporary working groups, the OPCW established a trust fund to which states can make voluntary contributions. The cost of one TWG meeting is estimated at \$22,000 (OPCW 2015).

A more significant set of costs would be those associated with the ISU, though these costs would still be significantly lower than those of standing organizations like the OPCW (annual budget of \$75 million) or the IAEA (annual regular budget of approximately \$400 million). Total salary costs for existing ISUs range from below \$200,000 up to \$400,000 depending on size and the nature of the work conducted. For example, the APLC-ISU total budget in 2018 was about \$490,000, including \$347,000 for 2.6 full-time equivalent staff positions (APLC 2018). The CCM-ISU budget in 2017 was about \$452,000, including \$395,000 for its 2.5 staff positions (CCM 2018b). The ISU operating costs for the units situated within UNODA were slightly lower, with CCW and BWC ISU operating costs on the order of \$200,000 for each unit (lower for the CCW, higher for the BWC, with yearly fluctuations reflecting occasional reduced operating activity due to deficits) (United Nations Secretariat 2019).

Overall, the combination of an ISU with an SAB offers a relatively low-cost path toward institutionalizing the TPNW and resolving substantive issues of implementation.

### ***Phase 2: Establishing an International Authority to Carry Out Disarmament Verification***

The next step in the evolutionary process of establishing a just-in-time, fit-for-purpose TPNW authority would be triggered by one or more nuclear weapon-possessing states deciding to join the TPNW. In this phase, States Parties would establish an organization that would serve as a competent international authority under the treaty – referred to here as the Organization for the Treaty on the Prohibition of Nuclear Weapons (or as noted above, simply the Organization), leveraging the already existing ISU and SAB structures. The process of rapidly establishing such an organization could draw on challenges and lessons from UNSCOM, set up in 1991 by the UN Secretary-General under Security Council Resolution 687 to verify the elimination of Iraq's biological and chemical weapons programs and banned ballistic missile activities and support the IAEA in its nuclear inspections there, its successor body UNMOVIC (created in 1999 under Security Council resolution 1284), and the IAEA teams that have been involved in verifying the elimination of various weaponized nuclear programs.

One challenge that arises in the rapid establishment of an international body able to perform disarmament-related inspections is to quickly recruit qualified experts that are independent enough from their national governments to be perceived as neutral by the inspected state.

As the first body to face this challenge, UNSCOM unfortunately failed to do so as it relied primarily on state-supplied and affiliated personnel. The UNSCOM structure functioned on two levels: the Commission level comprising an Executive Chairman and 20 Commission members served as a governing board, holding sessions twice yearly, and representing a range of skills and countries; the operational level comprising scientists and technical experts in the different types of weapons of mass destruction, as well as political, diplomatic and administrative support staff tasked with the day to day operations (120 people total) (United Nations, 2019b). The recruiting base for the initial inspection teams was primarily the group of weapons experts and scientific advisers to the governments' members at the Conference on Disarmament in Geneva (Ekeus 2016).

The reliance on state-supplied and affiliated personnel created issues of direct intelligence channels back to capitols that compromised the neutrality of the body. The United States, in particular, used UNSCOM to establish a surveillance mechanism without sharing this information with UNSCOM. Certain inspectors on these missions carried commercial scanners and recording devices into facilities to secretly intercept and record Iraqi security telecommunications. The United States, Britain, and Israel were involved in decrypting the clandestinely collected Iraqi messages. The revelation of this intelligence effort contributed to the ultimate discrediting of UNSCOM and its inability to reenter Iraq (Gellman 1999; Wright 1999).

For these and other reasons, UNSCOM's successor – UNMOVIC – made it a point to staff the Commission as employees of the United Nations (United Nations, 2019a). This contributed to the increased neutrality and allowed for building enduring expertise within UNMOVIC, as opposed to having frequent rotations of individuals from national governments.

Similar to UNSCOM, UNMOVIC included an Executive Chairman, a 20-member College of Commissioners, and five staff divisions that included between 40–70 employees. In addition, the core staff maintained a longer list of inspectors on a roster that could be called upon as needed (UNSC 2000b, 2003). The five staff divisions of UNMOVIC included the Division of Planning and Operations, responsible for planning, directing and performing all monitoring, verification and inspection activities; the Division of Analysis and Assessment, responsible for analyzing and assessing information from activities in the field and from other sources, such as information about export/import activities, overhead imagery and outside information; the Division of Information, which maintained a central repository of information and continuously integrated new information received from inspections and other sources; the Division of Technical Support and Training, responsible for planning and providing training and logistical support for inspection and monitoring operations and other missions; and the Administrative Service, responsible for budget, finance, personnel, recruitment, health, safety, translation and interpretation (UNSC 2000a).

UNMOVIC also conducted month-long training courses in order to foster an extensive roster of inspectors that could be called upon. While under UNSCOM such training had been largely the responsibility of member states, under UNMOVIC staff training was conducted solely under its own auspices. After the first training course in 2000, this roster included 23 persons, and by 2003, seven training courses yielded a roster of 380 individuals from 55 countries (UNSC 2000b). A lesson from both UNSCOM and UNMOVIC was that such rosters were invaluable for enabling the rapid deployment of inspectors (Findlay 2004).

This general principle of building a small core staff and a longer list of on-call inspectors provides a useful model for the TPNW. Given that the nature and frequency of inspections is likely to change throughout the disarmament verification process (which, depending on the size of the joining State's arsenal could take upwards of ten years), it could be useful to use a "roster" approach. Similar to the UNMOVIC process, this roster could be gradually built up at the outset of Phase 2 through training courses built from the guidance of the TPNW-SAB. Inspectors with relevant expertise would be called upon as needed, or contracted for certain periods of time, rather than maintained consistently as full-time staff. TPNW states could even begin the development of such a roster on a limited basis under the guidance of its SAB.

Another lesson from these past cases involves the scope for innovation in managing IAEA support for verification activities. In the early 1990s, decision-makers viewed employing the IAEA for disarmament inspections in Iraq as complicated and problematic. As described by Rolf Ekeus (2012):

"In order to fulfil his obligations, the [IAEA] Director General set up the Iraq Action Team, which was also independent of the IAEA's formal structures, including the Department of Safeguards ... The agency's institutional set-up and decision-making

structures (involving the General Conference and the Board of Governors) could not be adapted to the kinds of systematic operational activities that were expected for the disarmament and verification tasks ahead. Another problem in this context was that the verification mission was not limited to the IAEA's specialized field of nuclear fuel cycle matters but could be expected to relate to nuclear weapons technology and weapons design, with potential proliferation risks."

The process of overcoming these challenges in Iraq was transformative for the IAEA in a number of ways, including the addition of new inspection approaches and the development of the Additional Protocol to the standard Comprehensive Safeguards Agreement. These improvements helped the IAEA in its subsequent efforts at understanding and verifying the elimination of nuclear weapon program elements in South Africa, Libya and Iran. At the same time, challenges remain over the ability to rely solely on the IAEA for nuclear disarmament-related activities even for a country without a mature nuclear weapon program. In the case of Iran, which did not complete work to weaponize its nuclear program, the U.S. Government Accountability Office (GAO) found that the IAEA needed an additional \$10 million per year for 15 years on top of its existing safeguards budget to meet the demands of monitoring in Iran under the Joint Comprehensive Plan of Action (requiring extra-budgetary voluntary contributions by states), and faced concerns over being able to designate additional people to its Iran Task Force (renamed the Office of Safeguards Verification in Iran) and over meeting possible increased demand for environmental sample analysis associated with the inspections (U.S. GAO 2016).

A TPNW Organization would not aim to substitute for the IAEA, but instead adopt a model of cooperation and division of labor with it and other relevant disarmament verification organizations and processes. One approach might be to pursue cooperative verification supervised by the Organization, rather than undertaken by it, for instance with the weapon-state doing the work of elimination under the guidelines agreed with the TPNW as part of the "time-bound plan for the verified and irreversible elimination of that State Party's nuclear-weapon programme, including the elimination or irreversible conversion of all nuclear-weapons related facilities," with the IAEA taking responsibility for the fissile material accounting and safeguarding process once the materials are transferred to non-military facilities or such are facilities are opened for inspection (Podvig and Rogers 2017; Patton and Glaser 2019).

The IAEA would participate in the accounting of nuclear weapon material when any remaining classified properties are removed, since what today may be seen by a nuclear-armed state as classified information may no longer be treated as such after the state has committed to an irreversible disarmament process. This monitoring would include accounting for the amount of nuclear weapon materials produced and used and stockpiled by the state, the elimination or conversion of weapon program-related facilities to peaceful purposes, and safeguarding any remaining former nuclear weapon material during storage and final disposition (Feiveson et al. 2014; Shea 2018). The IAEA Model Additional Protocol (INFCIRC/540 Corrected), rather than the current restricted versions adopted by Britain, China, France, Russia and the United States (IPFM 2006), could serve as a model for a former nuclear weapon states safeguards agreement under TPNW

Article 4. It would provide part of the monitoring structure that will be needed to provide confidence in a former nuclear-armed state maintaining its disarmament status over the long term.

### ***Phase 3: Maintaining and Embedding Disarmament Verification within the United Nations***

After the completion of the disarmament process within the joining state, the Organization would need to evolve by downsizing and adapting to a more limited role. With UNMOVIC, some states argued for making the Commission a permanent body, whereas the U.S., among others, argued that it should be shut down in light of cost and the absence of a clear mandate after the verification of Iraq's disarmament. There are several reasons why the Organization for the TPNW usefully could be maintained in a more limited form so as to: (1) learn from and maintain the experience gained during the disarmament process; (2) support assessments of the compliance of former nuclear-armed states with their safeguards obligations; (3) guide the development of improved methods for nonproliferation and disarmament verification; (4) be prepared to support future disarmament verification processes; and (5) track long-term technological developments and processes that may affect the obligation that TPNW disarmament processes are intended to be "irreversible." Institutionally, the continued existence of the TPNW Organization also would play an important role in maintaining and embedding disarmament verification within the international nuclear nonproliferation and disarmament regime complex.

### **Conclusion**

The Treaty on the Prohibition of Nuclear Weapons faces important challenges regarding its implementation, especially the need to effectively verify its core disarmament obligations for states that had nuclear weapons after 7 July 2017 and join the treaty. The choice of a TPNW "competent international authority" must deal with the fact that one obvious choice for such an authority is the IAEA, but the IAEA is autonomous from the TPNW and has prior institutional, political and technical constraints. These constraints are shaped by the IAEA statute, Board of Governors, relationship to nuclear-armed states, acceptance of limits on access to nuclear weapons information, and the role accorded to the United Nations Security Council. Creating a TPNW-specific organization would address these issues and support treaty implementation and, as needed, serve as the treaty-designated competent international authority to manage disarmament verification. The evolutionary and adaptive organizational model proposed here retains an important role for the IAEA in disarmament verification as well as the specific safeguards tasks assigned to it by the TPNW, and the Organization for the Treaty on the Prohibition of Nuclear Weapons would closely work with it.

An analysis of existing treaties and experiences of disarmament verification suggests that an initial, small, dedicated Implementation Support Unit coupled to a Scientific Advisory Board offers a viable evolutionary path to an Organization for the Treaty on the Prohibition of Nuclear Weapons. This simple two-part structure, which could be set up at the first meeting of the TPNW States Parties, would keep costs to states minimal

while beginning to advance implementation of the treaty free from other pressures and to develop technical guidance on meeting the various obligations of the treaty, especially those concerning disarmament verification and the positive obligations on victim assistance and environmental remediation due to use or testing of nuclear weapons. This body also would serve as the nucleus of a competent international authority to be designated by TPNW member states to work with a nuclear armed state seeking to join the treaty on its “time-bound plan for the verified and irreversible elimination of that State Party’s nuclear-weapon programme, including the elimination or irreversible conversion of all nuclear-weapons related facilities.” It could be scaled-up and evolve as required to recruit and train inspectors and analysts and manage the verification of the agreed plan.

Afterwards, this Organization for the Treaty on the Prohibition of Nuclear Weapons could scale down and adapt to a long term role guiding and tracking TPNW related disarmament processes and technical developments. Assuming not all of today’s nine nuclear-armed states would join the TPNW together, this Organization would need to be prepared to repeatedly adapt as required to the disarmament tasks at hand as particular nuclear-armed states joined the treaty. The disarmament verification challenge in some states may be much larger than for others, depending for instance on the size, complexity, age and historical transparency of a state’s nuclear weapons program.

This approach to establishing an Organization for the Treaty on the Prohibition of Nuclear Weapons has the additional benefit of creating an institutional structure able to evolve and adapt to actually existing demands while further embedding TPNW-specific goals, practices and values in the current complex of nonproliferation, arms control and disarmament treaties, agreements, and organizations. This approach and the specific arrangements and organization outlined here, if successful, could evolve further to play a role in future broader and more wide-ranging disarmament processes and treaty structures that build on the TPNW.

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