REMEDYING THE LIMITATIONS OF THE CTBT?
TESTING UNDER THE TREATY ON THE PROHIBITION OF
NUCLEAR WEAPONS

CHRISTOPHER P EVANS

Various limitations on the testing of nuclear weapons already exist within international law, including the Treaty Banning Nuclear Weapons Tests in the Atmosphere, in Outer Space and Under Water of 1963, along with further restrictions on where testing is permitted and the maximum yield of such tests. Yet it was not until 1996 that the Comprehensive Nuclear-Test-Ban Treaty (‘CTBT’) was adopted, representing the first globally reaching prohibition of all forms of testing that result in a nuclear weapon ‘explosion’. The CTBT does not, however, cover subcritical and computer simulated nuclear tests, which can ensure the safety and reliability of existing stockpiles, thus undermining the CTBT’s implications for nuclear disarmament. More importantly, due to the onerous entry-into-force requirements under art XIV, the CTBT is not yet binding on states and is unlikely to become so in the near future. A further contribution to the legal restrictions on nuclear weapon testing has recently been provided by the Treaty on the Prohibition of Nuclear Weapons (‘TPNW’), which was adopted in July 2017. Under art 1(1)(a), states party undertake never, under any circumstances, to ‘develop’ or ‘test’ nuclear weapons or other nuclear explosive devices. Given the challenges facing the CTBT, this article seeks to analyse the extent of the testing prohibition established under art 1(1)(a) as well as the scope of the prohibition of development in order to determine whether the TPNW closes the testing ‘loophole’ established by the CTBT by including subcritical and computer simulated testing within either of these prohibitions. The article will conclude by offering some thoughts on the TPNW’s prospects for entry into force and its future relationship with the CTBT.

CONTENTS

I Introduction............................................................................................................... 2
II Early Nuclear Testing Prohibitions........................................................................... 5
III The Comprehensive Test-Ban Treaty...................................................................... 8
   A Scope of the Testing Prohibition .......................................................................... 9
   B Verification and Monitoring under the CTBT ...................................................... 14
   C Entry-into-Force Obstacles.................................................................................. 16
IV Background of the Treaty on the Prohibition of Nuclear Weapons...................... 19
V Scope of the Testing Prohibition under Article 1(1)(a) of the TPNW.................. 22
VI The Undertaking Never to ‘Develop’ Nuclear Weapons and Its Implications for Testing Obligations........................................................................................................... 29
VII TPNW Entry-into-Force Prospects and Its Relationship with the CTBT .......... 34
   A Entry into Force .................................................................................................. 34
   B Relationship with the CTBT ................................................................................ 37
VIII Conclusion............................................................................................................ 42

* PhD Researcher, School of Law, Global Law at Reading, University of Reading. I am grateful to Lawrence Hill-Cawthorne for his comments on an earlier draft of this article, and both James A Green and Aurel Sari for their wider feedback in relation to this topic generally. My thanks also go to the two anonymous reviewers for their useful comments on a previous version of this article. This work was supported by the Arts and Humanities Research Council, South-West and Wales Doctoral Training Partnership. All other views and mistakes are, of course, mine.
I INTRODUCTION

The prohibition of nuclear weapon testing is an issue that states have been grappling with for decades. However, it was not until the adoption of the Comprehensive Nuclear-Test-Ban Treaty (‘CTBT’) in 1996 that an apparently ‘comprehensive’ instrument prohibiting all forms of nuclear weapon test explosions was concluded.¹ Yet, while many continue to endorse the CTBT as one of the most significant ‘effective measures’ towards nuclear disarmament pursuant to art VI of the Treaty on the Non-Proliferation of Nuclear Weapons (‘NPT’),² prospects for its entry into force continue to look bleak in light of the onerous requirements imposed by art XIV(1) of the CTBT. This is despite repeated resolutions adopted by the United Nations General Assembly that have called upon states to ratify the CTBT as soon as possible.³ Moreover, the CTBT remains hindered by its failure to prohibit all variations of nuclear weapon testing activities, instead continuing to permit subcritical and computer simulated tests. These failures of the CTBT have remained largely unresolved over the past two decades, providing the nuclear weapon possessing states (‘NWPS’) with the ability to improve and ensure the reliability of existing stockpiles.

Although the majority of states have refrained from conducting nuclear weapons tests following the negotiation of the CTBT, recent events have reiterated the urgency of achieving an implemented, legally binding prohibition on all nuclear weapon testing activities. The Democratic People’s Republic of Korea (‘DPRK’) has conducted six nuclear weapon explosive tests since 2006, the latest of which took place in September 2017.⁴ In May 2019, Lieutenant General Robert Ashley, Director of the United States Defense Intelligence Agency, claimed that Russia had ‘probably’ carried out extremely low-yield nuclear tests in its remote Novaya Zemlya Arctic testing facilities in violation of the CTBT, though no evidence to support such claims has been offered.⁵ More recently, in April 2020,  

² Treaty on the Non-Proliferation of Nuclear Weapons, opened for signature 1 July 1968, 729 UNTS 161 (entered into force 5 March 1970) art VI (‘NPT’).
⁴ For a concise analysis of DPRK nuclear testing, see ‘Arms Control and Proliferation Profile: North Korea’, Arms Control Association (Fact Sheet, June 2018).
the US similarly claimed that China may have conducted secret low-yield tests at its Lop Nur test site, following increased excavation activities and the use of explosive containment chambers in 2019. In light of these accusations, and given the current trend of the US withdrawing from existing arms control arrangements such as the Intermediate-Range Nuclear Forces Treaty, the Joint Comprehensive Plan of Action and, most recently, the Treaty on Open Skies, it is not beyond the realm of possibility that the US may signal its intention not to ratify and no longer be bound by the CTBT. In fact, earlier this year in May 2020, US officials reportedly met to discuss the possibility of resuming nuclear testing, though it has been stressed that there has been no policy change as of yet.

However, it seems that all hope is not lost. On 7 July 2017, the Treaty on the Prohibition of Nuclear Weapons (‘TPNW’) was adopted at the United Nations Conference to Negotiate a Legally Binding Instrument to Prohibit Nuclear Weapons, Leading towards Their Total Elimination (‘2017 Negotiation Conference’). The Treaty represented the outcome of efforts coordinated by a committed group of non-aligned non-nuclear weapon states (‘NNWS’) and civil society activists, including the 2017 Nobel Peace Prize winner.

---


12 Treaty on the Prohibition of Nuclear Weapons, Agenda Item 9, UN Doc A/CONF.229/2017/8 (7 July 2017) (‘TPNW’).
Campaign to Abolish Nuclear Weapons (‘ICAN’). The principal objective of the humanitarian initiative, the group of non-nuclear weapons states and civil society actors behind the *TPNW*, was to prohibit all aspects of nuclear weapons due to the ‘catastrophic humanitarian consequences’ resulting from their use, and, as such, the adoption of the prohibition treaty would constitute an ‘effective measure’ towards the objective of nuclear disarmament. Given the challenges facing the *CTBT*, this article seeks to determine whether the undertaking never to ‘test’ or ‘develop’ nuclear weapons or other nuclear explosive devices under art I(1)(a) of the *TPNW* addresses existing ‘loopholes’ within the *CTBT*’s prohibitions, and aims to offer some insights on the *TPNW*’s prospects for entry into force and its future relationship with the *CTBT*.

This article proceeds as follows. Following the introduction in Part I, Part II offers a brief overview of the fragmented regulation of nuclear weapon testing implemented prior to the adoption of the *CTBT*. Part III is then dedicated to a more exclusive analysis of the *CTBT*, focusing on precisely identifying the testing prohibitions under art I(1). This section will also note the *CTBT* verification framework and highlight the challenging entry-into-force requirements imposed by art IX(3). Part IV then provides a brief account of the *TPNW*’s history and negotiation to shed light on the underlying interest and motivations that informed the adoption of the Treaty.

Following this preliminary discussion, Part V analyses the scope of the testing prohibition established under art 1(1)(a) of the *TPNW*. This will provide an examination of the ordinary meaning of the terms ‘test’, ‘nuclear weapon’ and ‘other nuclear explosive devices’ in the *TPNW*’s context and in light of its object and purpose, as well as investigating the *travaux préparatoires* to support the interpretation reached. Part VI will then explore an alternative means of incorporating non-explosive testing activities under the *TPNW* through the broader prohibition on ‘developing’ nuclear weapons or other nuclear explosive devices. As will be shown, it is the latter prohibition related to development that best captures non-explosive testing activities. Finally, Part VII discusses some prospects for the *TPNW* moving forward, particularly its potential for early entry into force, and the future relationship and compatibility of both the *TPNW* and the *CTBT* in light of the broader scope of testing prohibitions established by the new instrument.

Before proceeding, a caveat is in order. This article does not intend to touch upon the critical discussion of whether a parallel comprehensive prohibition of nuclear weapons exists under customary international law. Although it is generally

---

15 *TPNW*, UN Doc A/CONF.229/2017/8 (n 12) Preamble para 2. See *NPT* (n 2) art VI.
16 As the number of ratifications of the *TPNW* continues to increase, the author wishes to make clear that the discussion that follows is based on the number of ratifications as of 30 September 2020. It may, however, likely be the case that the *TPNW* has achieved its required 50 ratifications in order to enter into force by the time this article is published.
agreed that there exists a customary prohibition on atmospheric, underwater and outer space nuclear testing, it remains uncertain whether a customary prohibition on nuclear explosive tests in all environments, including underground testing, has crystallised at this time. My intention in this article is not to analyse the extent to which the widespread support for the TPNW prohibitions may have an effect on this developing parallel customary prohibition, but rather to analyse the state of treaty-based obligations in relation to nuclear weapon testing prohibitions.

II EARLY NUCLEAR TESTING PROHIBITIONS

While attempts to prohibit nuclear weapon testing can be traced back to the dawn of the nuclear weapons era, multilateral negotiations towards this goal did not commence until the early 1950s. With the growing awareness of the environmental harm caused by atmospheric nuclear testing, made evident by the unexpected fallout from the Castle Bravo test in the Bikini Atoll in 1954, many civil society-based advocacy movements, including the Russell–Einstein Manifesto in 1955 and subsequent Pugwash Conference in 1957, helped generate

---

17 See Gabriella Venturini, ‘Test-bans and the Comprehensive Test Ban Treaty Organization’ in Jonathan L Black-Branch and Dieter Fleck (eds), Nuclear Non-Proliferation in International Law (Asser Press, 2014) 133, 151; Andrew Michie, ‘Provisional Application of Non-Proliferation Treaties’ in Daniel H Joyner and Marco Roscini (eds), Non-Proliferation Law as a Special Regime: A Contribution to Fragmentation Theory in International Law (Cambridge University Press, 2012) 55, 80; Don MacKay, ‘The Testing of Nuclear Weapons under International Law’ in Gro Nystuen, Stuart Casey-Maslen and Annie Golden Bersagel (eds), Nuclear Weapons under International Law (Cambridge University Press, 2014) 292, 317. Peter Hulsroj has even gone so far as to suggest that the prohibition on atmospheric testing has achieved the status of jus cogens:


greater public awareness of the effects of nuclear weapon testing. In addition,
given the growing concern over the possible horizontal proliferation of nuclear
weapons to additional states, the continued escalation of the nuclear arms race and
the rising Cold War tensions as a result of events such as the U-2 spy plane incident
and the Cuban Missile Crisis during the early 1960s, it became increasingly clear
among states that reaching an agreement on a nuclear test ban was becoming
essential.

In light of the more amicable stance of both the US and the Soviet Union
towards restricting the proliferation of nuclear weapons, some progress towards
restricting nuclear weapon explosions came with the adoption of the
Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and
Under Water (‘PTBT’) in 1963. Under art I(1), the PTBT prohibits ‘any nuclear
weapon test explosion, or any other nuclear explosion’ in the atmosphere, outer
space, under water and ‘in any other environment if such explosion causes
radioactive debris to be present outside the territorial limits of the State under
whose jurisdiction or control such explosion is conducted’. While this
prohibition covers ‘peaceful’ nuclear tests through the inclusion of the phrase ‘any
other nuclear explosion’, underground nuclear explosive tests remain permitted,
provided that any such explosion does not result in radioactive debris spreading
into the territory of another state. Consequently, although the PTBT helped curb
radioactive pollution spreading throughout the atmospheric environment, David
Koplow argues that it has ‘not appreciably retarded the pace of explosions — it has simply driven them underground — or slowed the rate of weapons
development’.

Shortly after the adoption of the PTBT, the NPT was adopted in 1968 and
remains the ‘cornerstone’ of the nuclear non-proliferation and disarmament legal
framework. The NPT established two categories of states: the five de jure nuclear

22 Venturini (n 17) 137; Jonas, ‘The Comprehensive Nuclear Test Ban Treaty’ (n 19) 1011.
23 Goldblat (n 19) 48.
24 Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water, opened for signature 5 August 1963, 480 UNTS 43 (entered into force 10 October 1963) (‘PTBT’). This is commonly referred to as the Partial Test-Ban Treaty or the Limited Test-Ban Treaty.
25 Ibid art I(1).
26 Goldblat (n 19) 49.
27 Ibid 51.
28 Koplow, Testing a Nuclear Test Ban (n 19) 8.
weapon states (‘NWS’) under art IX(3) and all other NNWS. While the principal objective of the NPT was to prevent further horizontal proliferation of nuclear weapons, the Treaty contains an implicit prohibition on nuclear weapon testing applicable to NNWS parties under art II by obliging these states not to transfer, ‘manufacture, receive, control or otherwise acquire’ nuclear weapons or other nuclear explosive devices. Indeed, Lisa Tabassi notes that ‘it would be difficult to imagine circumstances in which a non-nuclear-weapon State could test and still be in compliance with Article II’. Moreover, this implicit prohibition under art II does not apply to the five NWS. Finally, the adoption of art VI requires states party to ‘pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament’. The NPT preamble similarly recognises the desire to build upon the PTBT in order to ‘achieve the discontinuance of all test explosions of nuclear weapons for all time and to continue negotiations to this end’. Though a treaty’s preamble is not legally binding, this recognition generated further impetus for states to conclude a comprehensive test ban treaty, which would constitute an ‘effective measure’ towards nuclear disarmament as envisaged by art VI.

In addition to the PTBT, other multilateral agreements that prohibit nuclear weapon testing in both uninhabited and inhabited regions were concluded. The Antarctic Treaty of 1959 prohibits the testing of any weapons, and specifically nuclear explosions, within its defined zone, while the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies of 1967 prevents the testing of any

29 NPT (n 2) art IX(3). An NWS is defined as a state ‘which has manufactured and exploded a nuclear weapon or other nuclear explosive device prior to 1 January, 1967’. This includes the US, the Soviet Union (and its successor state, Russia), the United Kingdom, France and China. All other states are therefore considered NNWS. At the same time, it is recognised that four states have since developed nuclear weapons after 1967 and are therefore considered de facto nuclear weapon possessing states. These are Israel, India, Pakistan and the DPRK. When collectively referring to all nine nuclear weapon possessing states, the acronym ‘NWPS’ will be used to differentiate from the five de jure NWS noted above. For a concise discussion that explores this distinction in the context of achieving universality under the NPT, see David S Jonas, ‘Variations on Non-Nuclear: May the “Final Four” Join the Nuclear Nonproliferation Treaty as Non-Nuclear Weapon States while Retaining Their Nuclear Weapons?’ [2005] (2) Michigan State Law Review 417, 433–6. See also ‘Nuclear Weapons: Who Has What at a Glance’, Arms Control Association (Fact Sheet, July 2019).


31 MacKay (n 17) 299.

32 Tabassi (n 18) 313.

33 NPT (n 2) art VI.

34 Ibid Preamble para 10.

35 Ibid art VI.

36 The Antarctic Treaty, opened for signature 1 December 1959, 402 UNTS 71 (entered into force 23 June 1961) arts I(1), II.
type of weapon, conventional or nuclear, on the moon or other celestial bodies.\textsuperscript{37} Moreover, five nuclear weapon-free zones (‘NWFZ’) within inhabited regions have been established by five separate treaties,\textsuperscript{38} each of which prohibit their respective states party from acquiring or testing nuclear weapons.\textsuperscript{39} The NWFZ treaties also include protocols that the NWS are able to ratify, which guarantee that the NWS will similarly refrain from conducting nuclear explosive tests in each specified region.\textsuperscript{40}

Nuclear weapon testing has also been restricted through the adoption of bilateral limitation arrangements between the US and the Soviet Union, the most significant of which was the Treaty between the United States of America and the Union of Soviet Socialist Republics on the Limitation of Underground Nuclear Weapon Tests (‘TTBT’) of 1974, imposing a maximum yield of 150 kts on nuclear test explosions.\textsuperscript{41} However, while this agreement helped constrain the development of high-yield nuclear weapons, the TTBT failed to sufficiently restrain the nuclear arms race between the US and the Soviet Union.\textsuperscript{42} Overall, given the extensive variety of adopted treaties addressing nuclear weapon testing, the testing prohibitory regime has rightfully been described by Tabassi as ‘fragmented’\textsuperscript{43} and similarly by Koplow as ‘inchoate and incomplete’.\textsuperscript{44}

### III THE COMPREHENSIVE TEST-BAN TREATY

In the end, it was not until 1994 that the Conference on Disarmament decided to ‘negotiate intensively a universal and multilaterally and effectively verifiable

\textsuperscript{37} Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, opened for signature 27 January 1967, 610 UNTS 205 (entered into force 10 October 1967) art IV.


\textsuperscript{39} Treaty of Tlatelolco (n 38) art 1(1)(a); Treaty of Rarotonga (n 38) arts 3, 6; Treaty of Bangkok (n 38) arts 3(1)(c), (2)(a); Treaty of Pelindaba (n 38) arts 3, 5; Treaty of Semipalatinsk (n 38) arts 3, 5.


\textsuperscript{42} Goldblat (n 19) 52–3.

\textsuperscript{43} Tabassi (n 18) 310.

comprehensive nuclear test ban treaty’. Two-and-a-half years of negotiations followed before agreement could be reached on the proposed draft treaty; however, the consensus-based Conference on Disarmament remained gridlocked due to India’s objection to the final treaty text. As a result, Australia forwarded the finalised treaty draft to the UN General Assembly, which subsequently adopted and annexed the draft to Resolution 50/245 on 10 September 1996. Three key aspects of the CTBT will be discussed: first, and most significantly, the extent of the testing prohibition established; secondly, a brief overview of its verification framework; and thirdly, the challenges posed by its unique entry-into-force requirements and the attempts to circumvent this, as proposed academically.

A Scope of the Testing Prohibition

According to art I(1) of the CTBT, ‘[e]ach State Party undertakes not to carry out any nuclear weapon test explosion or any other nuclear explosion, and to prohibit and prevent any such nuclear explosion at any place under its jurisdiction or control’. In addition, states party undertake to ‘refrain from causing, encouraging, or in any way participating’ in any nuclear weapon test explosions or other nuclear explosions. Although the obligation under art I(1) would seem, prima facie, to offer a fully comprehensive prohibition on both military and peaceful nuclear testing, it is accepted that the CTBT does not prohibit nuclear weapon testing activities that do not result in a nuclear explosion. Therefore, it is generally accepted that both subcritical and computer simulated testing experiments, among other activities that do not result in a self-sustaining nuclear reaction, remain permitted under the CTBT.

At this point, it is worth noting what exactly subcritical and computer simulated testing entails, as this will make clear the importance of these experiments in relation to the objectives of nuclear non-proliferation and disarmament. In subcritical experiments, fissile material used in nuclear warheads of a subcritical mass is used to simulate aspects of a nuclear explosion by exposing the nuclear material to chemical explosives under high pressure. However, rather than

---

47 CTBT, UN Doc A/50/1027 (n 1).
48 Ibid art I(1) (emphasis added).
49 Ibid art I(2).
50 Asada (n 18) 87.
51 See Goldblat (n 19) 68; Venturini (n 17) 145; Asada (n 18) 87; Patricia Hewitson, ‘Nonproliferation and Reduction of Nuclear Weapons: Risks of Weakening the Multilateral Nuclear Nonproliferation Norm’ (2003) 21(3) Berkeley Journal of International Law 405, 449 n 237.
52 This author will often refer to both concepts collectively under the broader brush of ‘non-explosive’ tests.
resulting in a sustained nuclear chain reaction, the closely controlled configurations of subcritical experiments mean that no actual explosion of the nuclear material occurs. These tests provide information ‘on the behavior of this key element [ie plutonium or other fissile materials] when it is subjected to the shock of an explosion’.53 This helps to analyse the condition and deterioration of fissile material over time, allowing state officials to determine whether existing nuclear weapons will continue to perform as originally intended.

Computer simulated tests, on the other hand, are somewhat more self-explanatory. By inputting into supercomputers data on the specifications of current or newly developed nuclear weapons alongside information gathered from previous explosive testing activities and research, states are able to obtain predictions regarding the expected performance of the nuclear weapon that has been simulated. This again allows NWPS54 to test and simulate how different components of existing or newly designed nuclear weapons will behave under certain conditions. For example, basic computer simulations of theoretical nuclear weapons explosions can be carried out on privately created interactive platforms such as NUKEMAP,55 although the expected effects and the inputted data would not be as accurate or detailed as those of extensively state-funded computer simulation experiments. Publicly accessible ‘simulation’ websites and hypothetical detonations also do not provide specific details on weapon performance, unlike state-funded, military computer simulations.

This interpretive conclusion on the extent of the prohibition on testing established by art I(1) of the CTBT is made apparent through an application of the standard rules of treaty interpretation provided by arts 31 and 32 of the Vienna Convention on the Law of Treaties (‘VCLT’).56 Article 31(1) states that a treaty shall be interpreted ‘in good faith in accordance with the ordinary meaning to be given to the terms of the treaty in their context and in the light of its object and purpose’.57 While art 31 to some degree encapsulates each of the three traditional schools of treaty interpretation,58 the International Law Commission has reiterated that ‘the text must be presumed to be the authentic expression of the intentions of the parties’, and therefore ‘the starting point of interpretation is the

54 For the differentiation between NWS and NWPS, see above n 29.
55 NUKEMAP (Website, 2012) <https://nuclearsecrecy.com/nukemap/>, archived at <https://perma.cc/39N9-YRZ5>. Though rather simplistic, this website allows the average person to input specified data on nuclear weapon yield and ‘detonate’ the device anywhere in the world, providing information on estimated casualties and radioactive fallouts, depending upon the type of detonation inputted.
57 Ibid art 31(1).
elucidation of the meaning of the text, not an investigation *ab initio* into the intentions of the parties.\(^{59}\)

It is first worth noting that what constitutes a nuclear weapon ‘test’ within the context of the *CTBT* is relatively clear and uncontroversial. Although undefined by the *CTBT* or *PTBT*, the word ‘test’ essentially refers to ‘[a] procedure intended to establish the quality, performance, or reliability of something, especially before it is taken into widespread use’.\(^{60}\) The ordinary meaning of this term in the present context of the *CTBT* is therefore appropriate to apply, as the objective of a nuclear weapon test is to ascertain that the device being tested works as intended. This does not pose any particular challenge.

What poses greater difficulty here is the notion of ‘nuclear weapon test explosion’ and ‘any other nuclear explosion’; in other words, precisely what device is being tested. First, the term ‘explosion’ is defined as ‘[a] violent shattering or blowing apart of something, as is caused by a bomb’\(^{61}\) or ‘a sudden, violent burst of energy, for example one caused by a bomb’.\(^{62}\) This would seem to entail a physical event through a release of energy, caused by a device of some kind, which would generally result in some form of material damage. Taking this definition as a starting point also proves practical as it would seem to align with our ordinary understanding of what a ‘nuclear weapon test explosion’ actually entails: an event where a nuclear bomb is detonated, be that underground, underwater, in outer space or in the atmosphere. Moreover, it is clear that this understanding captures nuclear explosive tests of either a military or ‘peaceful’ nature, despite efforts by China to carve out a possible exception permitting peaceful tests.\(^{63}\)

Another view advanced by Stuart Casey-Maslen and Tobias Vestner is that the prohibition under art I(1) of the *CTBT* ultimately reflects the obligation contained in art I(1) of the *PTBT* and, from their perspective, the inclusion of the phrase ‘nuclear weapon test explosion’ demonstrates that the ‘ban is limited to a functioning nuclear explosive device’ that results in a nuclear chain reaction and subsequent explosion.\(^{64}\) Indeed, the general objective of any weapons test is to check the ‘quality, performance, or reliability’\(^{65}\) of the finalised weapon, as opposed to testing specific components or aspects that form part of the completed weapon itself, which often occurs separately.\(^{66}\) Consequently, it seems clear that only the testing of a completed nuclear device that results in an explosive event

---


\(^{60}\) *Lexico* (online at 24 September 2020) ‘test’ (n¹, def 1).

\(^{61}\) *Lexico* (online at 24 September 2020) ‘explosion’ (def 1).

\(^{62}\) *Collins Dictionary* (online at 24 September 2020) ‘explosion’ (def 1).


\(^{65}\) *Lexico* (online at 24 September 2020) ‘test’ (n¹, def 1).

\(^{66}\) A useful example in this regard would be the separate testing of intercontinental ballistic missiles and other delivery systems capable of deploying the designed nuclear warhead.
(regardless of yield size) is prohibited by art I(1) of the CTBT, whereas any ‘non-explosive’ tests and experiments, including subcritical and computer simulated tests, would remain permitted by the CTBT.

This interpretation of art I(1) is further justified when considering both the context and the object and purpose of the CTBT. Preambles often reflect a treaty’s object and purpose and form part of a treaty’s context pursuant to art 31(2) of the VCLT. The CTBT preamble notes how the cessation of all nuclear weapon test explosions and all other nuclear explosions, by constraining the development and qualitative improvement of nuclear weapons and ending the development of advanced new types of nuclear weapons, constitutes an effective measure of nuclear disarmament and non-proliferation in all its aspects...

This largely reflects the divergent views of the NNWS and NWS over the primary object and purpose underlying the CTBT: that prohibiting nuclear weapon test explosions constitutes an effective measure towards nuclear disarmament for the former and a tool in preventing further proliferation for the latter.

Prohibiting only nuclear explosive tests under art I(1) of the CTBT can certainly contribute towards both these goals. With regard to non-proliferation, although it has been suggested that a potential proliferator with sufficient knowledge and access to nuclear materials could develop a first generation nuclear weapon with reasonable confidence and without requiring the need to explosively test the constructed device, it remains the case that the full testing of a nuclear weapon or explosive device would be necessary in order to ensure full confidence in the capacity of the constructed device. In other words, for any state that decides to construct a new nuclear device, subcritical and computer simulated tests alone would likely prove insufficient to ensure complete confidence in the developed device.

How this interpretation of art I(1) of the CTBT impacts the objective of achieving nuclear disarmament is perhaps more debatable. Masahiko Asada, writing in 2002, has noted that both Russia and the US have taken advantage of this testing ‘loophole’ in order to conduct ‘safety and reliability’ checks of their...

---

68 Though object and purpose are identified separately, it is generally considered that both should be considered from a unitary perspective, as both terms are synonymous with the notion of ‘goal’: David S Jonas and Thomas N Saunders, ‘The Object and Purpose of a Treaty: Three Interpretive Methods’ (2010) 43(3) Vanderbilt Journal of Transnational Law 565, 578.
69 VCLT (n 56) art 31(2).
70 CTBT, UN Doc A/50/1027 (n 1) Preamble para 5 (emphasis added).
Respective stockpiles. The US, for instance, recently carried out the ‘EDIZA’ subcritical test in February 2019. In addition, a recent study carried out by the China Academy of Engineering Physics has claimed that China has conducted approximately 200 computer simulated blasts between September 2014 and December 2017, while the DPRK also admitted to carrying out subcritical experiments in 2018 before the destruction of the Punggye-ri Nuclear Test Site in May 2018. However, even if the NWPS are conducting non-explosive tests for ‘safety and reliability’ purposes as so claimed, an obvious by-product of these experiments is that the lifespan of existing nuclear weapon stockpiles can be extended, thereby preventing the CTBT from realising one of its primary objectives, ‘which was to halt vertical proliferation and put the nuclear-armed states on the road to nuclear disarmament’. At the same time, considering that the subsequent practice of states can provide interpretative guidance as reaffirmed by art 31(3)(b) of the VCLT, arguably the acceptance (or, at the very least, the lack of protest from the broader international community) of these non-explosive testing activities further suggests that they remain permitted under the art I(1) prohibition in the CTBT.

Yet, on the other hand, the CTBT prohibition on nuclear weapon explosive tests does still impose significant limitations on the vertical proliferation of nuclear weapons among the NWPS. Most significantly, prohibiting the NWPS from conducting full-scale nuclear weapon tests prevents the testing state from ensuring that a modernised or ‘newly developed weapon in fact detonates as designed’. Non-explosive activities can only provide confidence in weapon performance to a certain degree and certainly cannot replace the information gathered from actual explosive tests. Furthermore, the entry into force of the CTBT is regularly cited as an essential ‘effective measure’ to be achieved pursuant to art VI of the NPT and the objective of nuclear disarmament, as the CTBT prohibition on all states conducting nuclear explosive tests can help establish a more conducive environment for nuclear disarmament. Consequently, to suggest that the ‘loophole’ created by the CTBT negates the Treaty’s practical benefits altogether is certainly naive, although closing such a gap would undoubtedly bring further benefits and potential for nuclear disarmament success.

74 Asada (n 18) 87–8.
78 Johnson, Unfinished Business (n 21) 180.
79 VCLT (n 56) art 31(3)(b).
80 Asada (n 18) 88.
Finally, art 32 of the VCLT holds that the travaux préparatoires of a treaty can be used to confirm the meaning of a treaty’s terms or to determine the meaning of a provision should its ordinary interpretation remain ambiguous or lead to a manifestly absurd result.\textsuperscript{82} However, the International Court of Justice (‘ICJ’) in the Territorial Dispute case has reiterated that this should not displace the fact that the ‘interpretation must be based above all upon the text of the treaty’.\textsuperscript{83} In relation to the present discussion, Asada has noted that Indonesia introduced an early proposal suggesting that the CTBT should be extended to prohibit subcritical experiments, though this was later withdrawn ‘in the spirit of compromise and for the sake of consensus’.\textsuperscript{84} India similarly supported the inclusion of computer simulated testing, arguing that the Treaty should prevent the NWS from developing ‘new advanced types of nuclear-weapons’, though again this proposed restriction was deemed unacceptable to the other NWPS.\textsuperscript{85}

In light of the above, it comes as no surprise that some commentators have questioned whether the prohibitions under art I(1) of the CTBT are fully ‘comprehensive’. Permitting subcritical and computer simulated testing allows the NWPS to take legally permitted steps through established ‘loopholes’ to prolong the existing lifespan of, and even qualitatively improve, existing nuclear weapon stockpiles, thus undermining the extent to which the CTBT can contribute to the objective of nuclear disarmament.\textsuperscript{86} Consequently, the need to establish testing prohibitions that incorporate both subcritical and computer simulated activities constitutes an essential step towards the long-term objective of nuclear disarmament.

B Verification and Monitoring under the CTBT

Perhaps one of the most successful and impressive features of the CTBT is the verification and monitoring framework that it establishes. Although this is not the place to explore this aspect of the CTBT in detail, a brief overview of the proposed verification mechanisms and process clearly demonstrates the importance of this component of the CTBT framework,\textsuperscript{87} especially when considering this article’s later discussion of how the TPNW may impact the operation of the CTBT.

Article II of the CTBT establishes the Comprehensive Nuclear-Test-Ban Treaty Organization (‘CTBTO’), an independent international organisation designed to oversee the implementation of the Treaty. Alongside this organisational body, the CTBT establishes a varied range of verification processes and mechanisms under

\textsuperscript{82} VCLT (n 56) art 32.
\textsuperscript{83} Territorial Dispute (Libya v Chad) ( Judgment) [1994] ICJ Rep 6, 22 [41] (‘Libya v Chad’).
\textsuperscript{84} Asada (n 18) 87, quoting Letter Dated 22 July 1997 from the Permanent Representative of Indonesia Addressed to the President of the Conference on Disarmament Transmitting a Press Release Issued by the Government of Indonesia on 18 July 1997 concerning the Subcritical Nuclear Weapon Experiment Conducted by the US Government on 2 July 1997, UN Doc CD/1469 (24 July 1997) 2.
\textsuperscript{85} Llewellyn (n 63) 271.
\textsuperscript{86} See, eg, den Dekker, ‘Forbearance is No Acquittance’ (n 71) 673; Goldblat (n 19) 59. However, it has been argued that extensive ‘explosive’ tests would be required to ensure confidence in new weapons to perform as designed: see van der Vink et al (n 73) 8; Asada (n 18) 88.
\textsuperscript{87} For an extended analysis of verification under the CTBT, see Johnson, Unfinished Business (n 21) 145–73; Asada (n 18) 89–92; Jonas, ‘The Comprehensive Nuclear Test Ban Treaty’ (n 19) 1017–18.
art IV and its associated protocols and annexes, often carried out with the involvement of the CTBTO. Arguably, the most important aspect of this framework is the International Monitoring System (‘IMS’), comprising 337 data collection and laboratory facilities globally that are capable of conducting seismological, hydro-acoustic and radionuclide detection to monitor nuclear explosive testing activities. The IMS is complemented by a system of onsite inspections, operational upon the CTBT’s entry into force, which allows any state party to request an inspection to determine whether another state party has conducted a nuclear test explosion contrary to its obligations under art I(1). Finally, an elaborate series of consultation, clarification and confidence-building measures is also established. Given this extensive detail, it is not surprising that the CTBT verification framework is often regarded as perhaps its most outstanding feature.

Moreover, despite the fact that the CTBT is not yet in force, the CTBTO is operating on a provisional basis following the adoption of the Text on the Establishment of a Preparatory Commission for the Comprehensive Nuclear Test-Ban Treaty Organization. The CTBTO Preparatory Commission (‘CTBTO PrepCom’) has functioned as a temporary surrogate body, tasked with establishing and implementing the verification regime under art IV prior to the CTBT’s entry into force. As such, a substantial portion of the CTBT’s verification system is already operational and has provided information relating to the recent DPRK nuclear tests, including data on the location, depth and magnitude of these tests. However, the highly significant onsite inspection arm will only come into effect, and therefore be able to be invoked by other parties, upon the entry into force of the CTBT as a whole. As such, although the CTBTO PrepCom has proved a genuine success in the interim, the full potential of the CTBT verification framework is yet to be realised.

89 CTBT, UN Doc A/50/1027 (n 1) art IV(16).
90 Ibid arts IV(34)–(35).
91 Ibid arts IV(29)–(33), (68).
92 Venturini (n 17) 146.
93 See below Part III(C).
95 Venturini (n 17) 153–4.
C  Entry-into-Force Obstacles

In addition to the ‘loopholes’ established under art I(1), the CTBT is further undermined by its unique entry-into-force requirements. Under art XIV(1), the CTBT will enter into force 180 days after the 44 states listed under annex 2,97 which the International Atomic Energy Agency listed in 1996 as having either nuclear power and/or research reactors,98 have ratified the Treaty.99 The supposed rationale here, as noted by the United Kingdom, China and Russia, was based on an intention to not accept restrictions on their nuclear programmes unless all “threshold” or aspirant nuclear-weapon programmes were likewise curbed,100 thereby imposing an equal constraint on all nuclear-capable states.101 In theory, this justification makes pragmatic sense, as it is unlikely that a NWPS will unilaterally restrict its testing activities unless all other NWPS are equally restrained. This reciprocity largely explains the success of recent moratoria on nuclear weapon testing that have been complied with by the majority of NWPS over the past 20 years.102

Despite the rationale behind this requirement, art XIV(1) of the CTBT has ultimately become a ‘veto’ power for the annex 2 states that has prevented the CTBT’s entry into force,103 largely due to individualistic, security-driven considerations in maintaining a modernised nuclear deterrent. India, for example, has consistently and vehemently opposed the CTBT generally, particularly raising objection to art XIV(1) and the discriminatory nature of the Treaty itself, as it maintains the dichotomy of nuclear ‘haves’ and ‘have nots’ and it fails to emphasise the importance of achieving progress towards nuclear disarmament.104 Other ‘hold out’ states have similarly offered little indication of their intention to

97  CTBT, UN Doc A/50/1027 (n 1) art XIV(1). These 44 states are Algeria, Argentina, Australia, Austria, Bangladesh, Belgium, Brazil, Bulgaria, Canada, Chile, China, Colombia, the DPRK, the Democratic Republic of the Congo, Egypt, Finland, France, Germany, Hungary, India, Indonesia, Iran, Israel, Italy, Japan, Mexico, the Netherlands, Norway, Pakistan, Peru, Poland, South Korea, Romania, Russia, Slovakia, South Africa, Spain, Sweden, Switzerland, Turkey, Ukraine, UK, US and Vietnam: at annex 2.
98  International Atomic Energy Agency, Nuclear Power Reactors in the World (Reference Data Series No 2, April 1996) 10–11 (Table 1).
99  Currently, China, the DPRK, Egypt, India, Iran, Israel, Pakistan and the US are yet to ratify the CTBT out of the 44 annex 2 states, a position unchanged since 2012 when Indonesia deposited their instrument of ratification: ‘Status of Signature and Ratification’, CTBTO Preparatory Commission (Web Page) <https://www.ctbto.org/the-treaty/status-of-signature-and-ratification/>; archived at <https://perma.cc/C45K-E28U>.
100  Rebecca Johnson, ‘Is It Time to Consider Provisional Application of the CTBT?’ [2006] (2) Disarmament Forum 29, 30.
101  Jozef Goldblat similarly notes how a simple numerical threshold would have left the testing option unconstrained for some states: Goldblat (n 19) 62.
102  In fact, the DPRK is the only state to have conducted nuclear weapons explosive tests in the 21st century: see ‘The Nuclear Testing Tally’, Arms Control Association (Fact Sheet, July 2020).
103  Venturini (n 17) 147.
ratify the Treaty in the near future. Despite becoming the first signatory under the Clinton administration, there has been either an inability or explicit unwillingness of the US to ratify the CTBT through the Senate.\(^{105}\) Indeed, the 2018 US Nuclear Posture Review explicitly states that the Trump administration will not seek Senate ratification of the CTBT at this time, but notes that it ‘will continue to support the Comprehensive Nuclear Test Ban Treaty Organization Preparatory Committee’.\(^{106}\) Although China’s current position on ratification is unclear, it has continued to cooperate in implementing the IMS verification mechanisms.\(^{107}\) Overall, it is highly unlikely that the CTBT will enter into force in either the short- or medium-term given the fierce opposition to the Treaty among some of the ‘hold out’ states, which seems unlikely to change in the near future.

Although the CTBT’s obligations are not directly binding pending the Treaty’s entry into force, both current signatories and ratified states remain under an ‘interim obligation’\(^{108}\) to ‘refrain from acts which would defeat the object and purpose of’ the CTBT, pursuant to art 18 of the VCLT.\(^{109}\) The only exceptions are if signatories ‘have made [their] intention clear not to become a party’ to the CTBT\(^{110}\) or, for ratifying states, if the entry into force has been ‘unduly delayed’.\(^{111}\) It has been convincingly argued, and claimed even by the NWS,\(^{112}\) that any nuclear explosive tests carried out prior to the entry into force of the CTBT would violate its object and purpose in contributing towards both nuclear non-proliferation and disarmament by unbalancing the ‘status quo’ that existed at the time of signature.\(^{113}\) Moreover, it is certainly foreseeable that a single nuclear

---

105 The CTBT was voted upon by the Senate in October 1999 but was defeated by a 51–48 vote: see Craig Cerniello, ‘Senate Rejects Comprehensive Test Ban Treaty; Clinton Vows to Continue Moratorium’ (1999) 29(6) Arms Control Today 26, 26.


109 VCLT (n 56) art 18 (emphasis added); Asada (n 18) 94. See also Jonas, ‘The Comprehensive Nuclear Test Ban Treaty’ (n 19) 1029–40; Tabassi (n 18) 313–21; Venturini (n 17) 148; MacKay (n 17) 302–5.

110 VCLT (n 56) art 18(a).


113 Tabassi (n 18) 317–20; den Dekker, ‘Forbearance is No Acquittance’ (n 71) 677–8; Asada (n 18) 95–7; Jonas, ‘The Comprehensive Nuclear Test Ban Treaty’ (n 19) 1035–40; MacKay (n 17) 302–3; Hewitson (n 51) 464. Although, an argument by Anthony Aust that a state must not do anything that ‘would affect its ability fully to comply with the treaty once it has entered into force’ would suggest that prior testing before entry into force would not impede the ability of states to fulfil obligations after entry into force, and thus would not defeat the object and purpose of the CTBT: Tabassi (n 18) 317, quoting Anthony Aust, Modern Treaty Law and Practice (Cambridge University Press, 2000) 94–5.
weapon test by one NWPS could even trigger testing by other NWPS in response.\(^{114}\)

Given the growing number of CTBT signatories and ratifications\(^{115}\) and annual General Assembly resolutions calling for the Treaty’s entry into force,\(^{116}\) and with near universal state practice in conformity with the testing prohibition in art I(1) of the CTBT, it would seem fair to suggest that entry into force is not currently unduly delayed,\(^{117}\) particularly when one considers the element of foreseeability of this delay based on the unprecedented and onerous entry-into-force requirements contained within art XIV(1). However, there remains a weakness in relying upon art 18 of the VCLT, as a signatory state can simply withdraw its consent to be bound and thereby make clear its intention not to become a party to the CTBT. Such withdrawal of signature by a NWPS ‘would be potentially fatal to the Treaty’, leading to a reciprocal resumption of testing by other nuclear weapon states.\(^{118}\) Article 18 therefore offers only limited respite in this respect.

Given this state of limbo, various recommendations have been raised to address the non-entry into force of the CTBT.\(^{119}\) Although art XIV(2) of the CTBT provides for conferences aimed at accelerating the ratification process, little progress has been made in bringing the remaining annex 2 states closer to ratification.\(^{120}\) Other suggestions to resolve the CTBT’s non-entry into force include the provisional application of the entire CTBT pursuant to art 25 of the VCLT,\(^{121}\) potential amendment of the CTBT text\(^{122}\) and the possible adoption of a Chapter VII UN Security Council resolution that would “determine” that any further nuclear weapon testing by any country would constitute a “threat to the peace” and “decide” that no such testing shall be done’.\(^{123}\) Each of these proposals


\(^{116}\) For recent examples, see Resolution 73/86, UN Doc A/RES/73/86 (n 3); Resolution 72/70, UN Doc A/RES/72/70 (n 3).

\(^{117}\) For a progressive confirmation of this, see den Dekker, ‘Forbearance is no Acquittance’ (n 71) 676; Tabassi (n 18) 315–7; Michie (n 17) 79; Venturini (n 17) 148; MacKay (n 17) 303–4. But see Rietiker, ‘The (Il?)legality of Nuclear Weapons Tests’ (n 18), who suggests that the extended passage of time of 24 years is more likely to be considered as unduly delayed in the present day.

\(^{118}\) MacKay (n 17) 305.

\(^{119}\) For a useful discussion of many of these possible approaches, see David A Koplow, ‘Nuclear Arms Control by a Pen and a Phone: Effectuating the Comprehensive Test Ban Treaty without Ratification’ (2015) 46(2) Georgetown Journal of International Law 475 (‘Nuclear Arms Control by a Pen and a Phone’).

\(^{120}\) Koplow, ‘Sherlock Holmes Meets Rube Goldberg’ (n 44) 23.

\(^{121}\) See generally Johnson, ‘Is It Time to Consider Provisional Application of the CTBT?’ (n 100); Anguel Anastassov, ‘Can the Comprehensive Nuclear-Test-Ban Treaty Be Implemented before Entry into Force?’ (2008) 55(1) Netherlands International Law Review 73.

\(^{122}\) Venturini (n 17) 151.

\(^{123}\) Koplow, ‘Nuclear Arms Control by a Pen and a Phone’ (n 119) 501.
has either failed to gain sufficient state support or contains various other defects, which limit its potential utility for present purposes.

As such, although the entry into force or alternative implementation of the CTBT would certainly be a welcome addition to the nuclear non-proliferation and disarmament legal framework by providing a global, legally binding prohibition on nuclear weapon test explosions and effectuating its verification framework, at present, the Treaty remains stagnant with limited prospects of change in the foreseeable future. When this is coupled with the fact that non-explosive testing remains permitted by art I(1) of the CTBT, the Treaty ultimately fails to offer a truly comprehensive — or realistically achievable — framework prohibiting all nuclear testing activities under international law at this time. In light of this rather bleak conclusion, the importance of assessing the scope and potential impact of the prohibitions under the TPNW becomes apparent.

IV BACKGROUND OF THE TREATY ON THE PROHIBITION OF NUCLEAR WEAPONS

The TPNW emerged as a result of the civil society-led humanitarian initiative, consolidating a new trend towards ‘humanitarian disarmament’ that sought to raise awareness of, and ultimately address, ‘the catastrophic humanitarian consequences of any use of nuclear weapons’. At the same time, there was an underlying sense of frustration among the non-aligned NNWS over the slow pace of disarmament efforts by the NWS pursuant to art VI of the NPT. Despite identifying effective measures towards nuclear disarmament at both the 2000 and 2010 NPT review conferences, including, amongst other steps, ratification of the CTBT, progress towards the implementation of these identified steps has been very limited. Moreover, all of the NWPS continue to rely upon nuclear

Two paths emerged to pursue this humanitarian-based agenda. The first was a series of ‘humanitarian conferences’ held between March 2013 and December 2014, providing space for academic experts, civil society groups including both the International Committee of the Red Cross (‘ICRC’) and ICAN, and non-aligned NNWS to raise public awareness of the immediate and long-term humanitarian consequences of nuclear weapon use. The final Vienna Conference on the Humanitarian Impact of Nuclear Weapons saw the endorsement of the Humanitarian Pledge, which recognised the need to ‘identify and pursue effective measures to fill the legal gap for the prohibition and elimination of nuclear weapons … in light of their unacceptable humanitarian consequences and associated risks’.

The non-aligned NNWS were concurrently taking steps within both the NPT review process and the UN General Assembly through a series of joint ‘humanitarian’ statements, the first of which was issued by Switzerland at the 2012 Preparatory Committee for the 2015 Nuclear Non-Proliferation Treaty Review Conference. This statement welcomed the conclusions of the 2010 Review Conference for the Treaty on the Non-Proliferation of Nuclear Weapons, reiterated the ‘utmost importance that these [nuclear] weapons never be used again’ and argued that ‘[t]he only way to guarantee this is the total, irreversible and verifiable elimination of nuclear weapons’. The content of the subsequent statements did not change substantively. However, the number of co-sponsors increased at an impressive rate, with the final statement in the NPT review process being supported by 159 states at the 2015 Review Conference for the Treaty on the Non-Proliferation of Nuclear Weapons (‘2015 NPT Review Conference’) and support in the General Assembly First Committee for a near identical statement
growing from 34 co-sponsors in 2012 to 155 states just two years later. In addition, the General Assembly adopted Resolution 67/56, establishing an open-ended working group (‘OEWG’) in 2013 to ‘develop proposals to take forward multilateral nuclear disarmament negotiations’.

Despite this growing support for the humanitarian initiative and the desire to begin negotiations towards new effective measures towards disarmament, the 2015 NPT Review Conference failed to reach consensus on a final document. Consequently, the non-aligned NNWS turned back to the UN and adopted General Assembly Resolution 70/33, which called for the convening of a second OEWG in order ‘to substantively address concrete effective legal measures, legal provisions and norms that will need to be concluded to attain and maintain a world without nuclear weapons’. The final report of the 2016 OEWG concluded that the ‘majority of States’ expressed support for the convening, by the General Assembly, of a conference in 2017, open to all States, with the participation and contribution of international organizations and civil society, to negotiate a legally binding instrument to prohibit nuclear weapons, leading towards their total elimination …

Soon after, the General Assembly adopted Resolution 71/258 establishing the mandate for the subsequent 2017 negotiations.

The negotiations took place in two sessions in March and June–July 2017, with representatives from 125 states participating alongside many experts from civil society offering further insights. It was soon clear that a prohibition-style

---


140 Ibid 19 [67] (emphasis added).


142 For a discussion of the negotiations, see Casey-Maslen, The Treaty on the Prohibition of Nuclear Weapons: A Commentary (n 76) 47–53.

143 For a list of the participants throughout the negotiations, see List of Participants, UN Doc A/CONF.229/2017/INF/4/Rev.1 (25 July 2017). Interestingly, other sources cite as many as 132 participants: see Gibbons (n 14) 27 n 90, citing ‘Draft UN Nuclear Weapon Ban Released’, ICAN (Web Page) <https://www.icanw.org/draft_un_nuclear_weapon_ban_released/>, archived at <https://perma.cc/P88U-ZACX>. Casey-Maslen notes that 129 states were registered participants: ibid 51. These counts likely include the six non-state participants attending the negotiations.
treaty was generally preferred by participants as the most achievable outcome possible, particularly given the lack of participation by any of the NWPS.144 After revising various draft texts put forward by the Conference President Ambassador Elayne Whyte Gómez of Costa Rica, the final treaty text was put to a vote before the Conference on 7 July 2017, with 122 states voting in favour, one abstaining (Singapore) and one voting against (the Netherlands).145

The TPNW preamble reiterates the negotiating states’ deep concern about the catastrophic humanitarian consequences that would result from any use of nuclear weapons, and [their recognition of] the consequent need to completely eliminate such weapons, which remains the only way to guarantee that nuclear weapons are never used again …146

Moreover, para 15 of the preamble recognises that ‘a legally binding prohibition of nuclear weapons constitutes an important contribution towards the achievement and maintenance of a world free of nuclear weapons’, an end to which the states party are ‘determined to act’.147 This clearly reaffirms the underlying objective of addressing the humanitarian suffering caused by nuclear weapons through the elimination of nuclear weapons, thereby contributing towards nuclear disarmament and eventually achieving and maintaining a nuclear weapon-free world.148

It must be emphasised at this stage that the TPNW goes further than prohibiting just the testing of nuclear weapons and other explosive devices. Instead, the Treaty builds upon the existing regional NWFZ and other disarmament treaties, and incorporates perhaps the most detailed and comprehensive range of prohibitions in order to facilitate efforts towards nuclear disarmament.149 Thus, while this article focuses solely on the breadth of the testing prohibitions, this overarching objective of facilitating the elimination of nuclear weapons must be kept in mind throughout the present discussion.

V SCOPE OF THE TESTING PROHIBITION UNDER ARTICLE 1(1)(A) OF THE TPNW

It was apparent throughout the TPNW negotiations that some reference to a prohibition on nuclear weapon testing was desired by the majority, though not all, of the participating delegations in order to reinforce the intended comprehensiveness of the prohibitions as a whole.150 However, it soon became

---

144 Rietiker, ‘The Treaty on the Prohibition of Nuclear Weapons’ (n 130) 331.
147 Ibid Preamble para 15 (emphasis added).
148 See Marco Pedrazzi, ‘The Treaty on the Prohibition of Nuclear Weapons: A Promise, a Threat or a Flop?’ (2017) 27 Italian Yearbook of International Law 215, 220. See especially ibid Preamble paras 8–10 for specific reference to the need to comply with international humanitarian law.
149 For an excellent overview of the TPNW prohibitions and wider provisions, see generally Casey-Maslen, The Treaty on the Prohibition of Nuclear Weapons: A Commentary (n 76).
clear that the exact form and scope of this prohibition would prove to be the subject of much debate during the negotiations. Eventually the final text was reached under art 1(1)(a) of the TPNW, which says:

1. Each State Party undertakes never under any circumstances to:

   (a) Develop, test, produce, manufacture, otherwise acquire, possess or stockpile nuclear weapons or other nuclear explosive devices …

Although the TPNW does not define the term ‘test’ at any point, based on the assessment of the ordinary meaning of the word ‘test’ undertaken in relation to the CTBT, and given that all the discussed treaties in Parts II and III have a similar subject matter regarding the regulation of nuclear weapon testing activities, one can reasonably assume that the understanding of the term ‘test’ accepted previously was intended to carry through to the TPNW. Indeed, there is no indication to suggest that this would not be the case, nor was there any discussion during the negotiations clarifying precisely what ‘test’ means in the TPNW context. Thus, as with the CTBT, the ordinary meaning of the term ‘test’, that being a ‘procedure intended to establish the quality, performance, or reliability of something, especially before it is taken into widespread use’, remains suitably applicable in the context of the TPNW.

However, upon closer inspection, it is apparent that the TPNW prohibition under art 1(1)(a) imposes a slightly different formulation of the testing prohibition in comparison to that of the CTBT. Whereas art I(1) of the CTBT prohibits each state party from carrying out any ‘nuclear weapon test explosions’ or ‘any other nuclear explosions’, art 1(1)(a) of the TPNW adopts a subtly different phrasing, stating: ‘each State Party undertakes never under any circumstances to … test … nuclear weapons or other nuclear explosive devices’. Consequently, art 1(1)(a) seemingly prohibits (1) the testing of nuclear weapons, without imposing a qualification that an ‘explosion’ is required; and (2) the testing of other nuclear explosive devices, which includes an ‘explosion’ requirement as with the CTBT. In other words, while the concept of ‘test’ poses few interpretative challenges, the issue here concerns what precisely is being tested in the first place, that is, the subject matter of the test.

Dealing with the second prohibition first, the Treaty of Rarotonga defines a nuclear explosive device as ‘any nuclear weapon or other explosive device capable of releasing nuclear energy, irrespective of the purpose for which it could be used’. The term also ‘includes such a weapon or device in unassembled and partly assembled forms’. This definition, therefore, covers fission and thermonuclear devices that have not been weaponised because, for example, they are too large for existing delivery systems, as well as the use of such devices for

---

152 TPNW, UN Doc A/CONF.229/2017/8 (n 12) art 1(1)(a) (emphasis added).
153 See Part III(A).
154 Lexico (online at 24 September 2020) ‘test’ (n1, def 1).
155 Treaty of Rarotonga (n 38) art 1(c) (emphasis added). See also Treaty of Pelindaba (n 38) art 1(c).
156 Treaty of Rarotonga (n 38) art 1(c) (emphasis added). See also Treaty of Pelindaba (n 38) art 1(c).
any purpose, including peaceful purposes. While this certainly captures both peaceful and military nuclear explosive detonations in a comparable manner to the CTBT, it seems unlikely that such a definition would cover non-explosive testing activities due to the retained requirement of an explosive event.

A more challenging question is, what constitutes a nuclear weapon? Unlike the definitions of the prohibited weapons provided by the Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction (‘BWC’), and the Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on Their Destruction (‘CWC’), there is no agreed definition of the term ‘nuclear weapon’ under the NPT and CTBT, nor under international law more generally. A useful definition is provided by art 5 of the Treaty of Tlatelolco, which defines a nuclear weapon as ‘any device which is capable of releasing nuclear energy in an uncontrolled manner and which has a group of characteristics that are appropriate for use for warlike purposes’. Lexico defines ‘nuclear weapon’ in a more simplistic manner as ‘[a] bomb or missile that uses nuclear energy to cause an explosion’. While calling for the inclusion of a definition of nuclear weapons within the TPNW, Sweden submitted a working paper to the 2017 Negotiation Conference defining ‘nuclear weapon’ as a ‘[weapon] assembly that is capable of producing an explosion and massive damage and destruction by the sudden release of energy instantaneously released from self-sustaining nuclear fission and/or fusion’. This directly drew upon the P5 Glossary of Key Nuclear Terms definition established by the permanent members of the Security Council.

As a result, and similar to the understanding reached in relation to the prohibition of nuclear weapon test explosions under the CTBT and the PTBT, the term ‘nuclear weapon’ in the TPNW seems to require the detonation of a completed nuclear device that is able to release nuclear energy (as ordinarily understood) as an essential aspect of the explosion taking place, be that through a fission- or fusion-based uncontrolled nuclear chain reaction. Consequently,

158 Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction, opened for signature 10 April 1972, 1015 UNTS 163 (entered into force 26 March 1975) art I(1) (‘BWC’).
159 Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on Their Destruction, opened for signature 13 January 1993, 1974 UNTS 45 (entered into force 29 April 1997) arts II(1)–(3) (‘CWC’).
160 Treaty of Tlatelolco (n 38) art 5 (emphasis added). See also Treaty of Pelindaba (n 38) art 1(c); Treaty of Semipalatinsk (n 38) art 1(b).
161 Lexico (online at 19 May 2020) ‘nuclear weapon’ (emphasis added).
165 See Casey-Maslen and Vestner (n 64) 92.
although art 1(1)(a) of the *TPNW* is linguistically distinctive from art I(1) of the *CTBT*, it would initially seem clear that the *TPNW* prohibition, based upon its ordinary meaning alone, would only cover nuclear weapon or explosive devices tests that result in a nuclear explosion event releasing nuclear energy. This again would seem to permit subcritical and computer simulated testing on similar grounds to art I(1) of the *CTBT*.

On the other hand, when one recalls the object and purpose of the *TPNW* in facilitating nuclear disarmament generally, it would seem reasonable to give a greater degree of leniency in support of an expansive interpretation of the general prohibitions included within art 1. Although analysing the object and purpose of a treaty forms a ‘secondary or ancillary process in the application of the general rule on interpretation’, Ian Sinclair does suggest that the object and purpose can still be used to test, confirm and modify the conclusion reached from a textual approach if appropriate.167 From this perspective, it seems somewhat counterintuitive to permit non-explosive activities that may hinder the realisation of the *TPNW*’s fundamental object and purpose of achieving nuclear disarmament.

At the same time, however, an over-reliance on a teleological approach to interpretation can risk distorting the ordinary meaning of the text, which should always remain the starting point.168 A similar conclusion was reached during *Case No A28* by the Iran–United States Claims Tribunal, which noted that ‘a treaty’s object and purpose is to be used only to clarify the text, *not to provide independent sources of meaning* that contradict the clear text’.169 Consequently, while the *TPNW*’s object and purpose may support the position that a wider prohibition on testing should be adopted, this should not come at the expense of undermining, and ultimately contradicting, the ordinary meaning of art 1(1)(a) reached above.

Another interesting argument is raised by Marco Roscini — though admittedly not in the context of the *TPNW* — when he compares the language incorporated in art 5 of the *Treaty of Semipalatinsk* (which prohibits ‘nuclear weapon test explosion[s]’ in a similar manner to the *CTBT*)170 with the obligations adopted in both the *Treaty of Tlatelolco* and the *Treaty of Bangkok* (which prohibit the testing of nuclear weapons without directly referencing the need for a nuclear explosion,171 consistent with the prohibition under art I(1)(a) of the *TPNW*). Although Roscini suggests this may simply have been an ‘oversight’ by the negotiators of these treaties, he argues that the consequence of this linguistical difference is that the *Treaty of Semipalatinsk* imposes a narrower, more specific obligation prohibiting ‘nuclear weapon explosions’ only, whereas the *Treaty of Tlatelolco* and the *Treaty of Bangkok* impose a more general and therefore wider

---

167 Sinclair (n 58) 130.
168 A point that Sinclair also concedes: ibid 131.
169 (United States v Iran) (Decision) (Iran–United States Claims Tribunal, Case No A28, 19 December 2000) [58] (emphasis added) (‘*Case No A28*’). See also Golder v United Kingdom (1979–80) 1 EHRR 524, 557–76 [23]–[47] (Judge Fitzmaurice). Judge Fitzmaurice discusses the possibility of inventing new obligations that are otherwise absent from the actual text of a treaty when adopting a teleological standard.
170 *Treaty of Semipalatinsk* (n 38) art 5.
171 See *Treaty of Tlatelolco* (n 38) art 1(1)(a); *Treaty of Bangkok* (n 38) art 3(1)(c).
obligation by referring solely to the term ‘test’ of nuclear weapons, which can encompass both simulated and subcritical tests.\textsuperscript{172}

When applied to the present discussion, Roscini’s argument would suggest that the \textit{TPNW} establishes a more general, comprehensive undertaking not to test nuclear weapons in a broader sense, in contrast to the specific requirement not to conduct nuclear test explosions under art I(1) of the \textit{CTBT}. This conclusion is similarly shared by Daniel Rietiker and Manfred Mohr, who claim that ‘\textit{w}hile the [\textit{TPNW}] refers to nuclear “test” very generally’, the \textit{CTBT}, in contrast, imposes a more specific requirement that an explosion must have occurred.\textsuperscript{173} The authors similarly argue, albeit much more briefly, that this clear difference creates a broader prohibition that extends to subcritical and computer simulated tests, thus adopting a similar line of reasoning to that proposed by Roscini.\textsuperscript{174} In other words, this difference of phrasing should be considered a significant and deliberate alteration from that of art I(1) of the \textit{CTBT}, as opposed to an oversight of the negotiating delegations of the \textit{TPNW}.

This presents an intriguing point and is particularly persuasive when one considers the preparatory history of the \textit{TPNW}. As noted, art 32 of the \textit{VCLT} provides for recourse to the \textit{travaux préparatoires} of a treaty to either confirm the meaning of the treaty after applying the general rule of treaty interpretation under art 31 or to aid its interpretation if, following an assessment under art 31, the meaning remains ‘ambiguous or obscure’ or ‘leads to a result which is manifestly absurd or unreasonable’.\textsuperscript{175} While Sinclair notes that use of the \textit{travaux préparatoires} is commonly referred to in international disputes related to interpretational matters,\textsuperscript{176} the ICJ is generally cautious when resorting to the \textit{travaux préparatoires}, reiterating that ‘\textit{i}nterpretation must be based above all upon the text of the treaty’.\textsuperscript{177} However, in light of the present ambiguity, the \textit{travaux préparatoires} may help shed some light on the current discussion.

In the first draft of the \textit{TPNW} submitted on 22 May 2017, Conference President Whyte Gómez included the following prohibition: ‘Each State Party undertakes never under any circumstances to … \{c\}arry out any nuclear weapon test explosion or any other nuclear explosion’.\textsuperscript{178} In effect, the 22 May draft would have contained a precise duplication of the prohibition under art I(1) of the \textit{CTBT} and would have therefore presented little controversy regarding the scope of the obligation established. In explaining the first draft, President Whyte Gómez noted that she drew upon inputs from participating states during the March negotiation.

\textsuperscript{173} Daniel Rietiker and Manfred Mohr, \textit{Treaty on the Prohibition of Nuclear Weapons: A Short Commentary Article by Article} (Report, April 2018) 42.
\textsuperscript{174} Ibid.
\textsuperscript{175} \textit{VCLT} (n 56) art 32.
\textsuperscript{176} Sinclair (n 58) 142.
\textsuperscript{177} \textit{Libya v Chad} (n 83) 22 [41].
session and synthesised ‘common elements’ into the draft text, while emphasising that the proposed treaty text ‘should … in no way undermine the nuclear non-proliferation regime … but … strengthen and complement it’. However, as negotiations continued, it was clear that three separate approaches regarding the extent of the testing prohibition to be included were gradually emerging amongst the participating state delegations. First, a number of states, including Brazil, Cuba and Ecuador, called for a broader approach to the concept of testing under art 1 from an early stage. Casey-Maslen notes that Ecuador in particular ‘wanted to see subcritical testing explicitly prohibited’. A second group of states sought to pay deference to the continued importance of the CTBT, which was incorporated into Preamble para 19 of the TPNW. Among these states, Guatemala called for the inclusion of the undertaking never to test nuclear weapons or other nuclear explosive devices, which was eventually adopted. The final group sought to delete any specific obligation relating to nuclear testing. These states included both Sweden and Mexico, who argued that art 1(1)(e) as originally drafted was unnecessary, as the prohibition was already covered by the CTBT, and that its inclusion even risked undermining the CTBT framework by creating an alternative prohibitory framework.

In essence, the travaux préparatoires clearly highlight the lack of consensus among the participating delegations throughout the negotiations as to whether an explicit reference to subcritical and computer simulated testing, and in fact testing in general, should be included within the TPNW. As such, the fact that the testing obligation under art 1(1)(a) remains open to some degree of interpretation comes as no surprise. Consequently, Casey-Maslen notes how the final provision incorporated within art 1(1)(a) reflected a ‘compromise’ for the participating

---

delegations, but at the same time he concedes that the final prohibition was ‘narrower than a number of states had advocated’. This conclusion therefore suggests, at least implicitly, that the final testing prohibition, despite its alteration away from the wording of art I(1) of the CTBT, still remains limited to explosive testing, leaving both subcritical and computer simulated tests beyond the TPNW’s scope.

At the same time, if complementarity with the CTBT were desired by the drafters — as suggested by President Whyte Gómez — there would have been no reason to move away from the 22 May draft prohibition on testing that precisely duplicated the pre-existing CTBT prohibition under art I(1). In other words, given that the testing prohibition under art 1(1)(a) of the TPNW represents a ‘compromise’, as suggested by Casey-Maslen, it would seem reasonable to conclude that a conscious decision was reached amongst the negotiating states to move away from the narrower CTBT prohibition and instead incorporate a wider range of obligations. The fact that the negotiating delegations explicitly decided to alter the wording of testing prohibition from the initial 22 May draft text could therefore be said to be a reflection of the desire to include a broader obligation under art 1(1)(a).

Yet, although this argument seems persuasive, it remains somewhat telling that despite calls by Ecuador and Brazil for the inclusion of an explicit prohibition on subcritical and computer simulated tests within the TPNW, ultimately no such prohibition was agreed upon and incorporated into the final treaty text. This stands in contrast to the explicit prohibition of subcritical and computer simulated tests, alongside other experimental activities, within the proposed (but now dormant) 1997 Model Nuclear Weapons Convention.

Article 1(1)(a) of the TPNW instead remains both imprecise and vague in comparison to the explicit prohibition included in the Model Nuclear Weapons Convention, which again alludes to the lack of consensus amongst the participating states. In other words, even if an expanded testing prohibition was desired by many states, this has been poorly reflected in the final prohibition under art 1(1)(a), leaving the precise extent of this obligation open to varying degrees of interpretation.

Moreover, the subsequent practice of states, a further tool of treaty interpretation under art 31(3)(b) of the VCLT, similarly reflects the contrasting interpretations of the scope of the testing prohibition established by art 1(1)(a) of

---

186 Ibid 144.
189 VCLT (n 56) art 31(3)(b).
the TPNW. Upon ratifying the TPNW, Cuba declared its interpretation of testing, claiming that ‘[t]he prohibition on the testing [of] nuclear weapons contained in Article 1(a) [sic] encompasses all forms of testing, including those performed using non-explosive methods such as subcritical testing and computer simulation’.190 A similar sentiment was expressed by Nigeria191 and, towards the end of the negotiations, Ecuador.192 At the same time, other states continued to express opposition to the inclusion of a testing prohibition altogether. Sweden, for example, noted its ‘strong preference not to have nuclear testing in this Treaty’,193 while Switzerland referred to the prohibition as a ‘generic reference to nuclear testing’, suggesting that this clear lack of specificity may risk undermining the existing CTBT norm.194 Additionally, Kazakhstan argued during the final stages of negotiations that the TPNW ‘should have included subcritical testing’,195 and Iran wanted ‘all types of testing specifically prohibited’, according to one observer.196

Overall, it seems apparent that the final text has resulted in a vague formulation of the prohibition on testing nuclear weapons that remains open to differing interpretations by states and commentators alike. Taking a more cautious perspective, it seems difficult to confirm with any certainty that non-explosive testing activities are captured under the testing prohibition established by art 1(1)(a). This, however, does not deprive the testing prohibition in the TPNW of value. On the contrary, given the current frailty of the CTBT, its failure to enter into force and recent suggestions by the US of non-compliance of Russia and China, the prohibition on nuclear explosive tests under the TPNW provides a welcome duplication of the CTBT prohibitions. Once in force, the testing prohibitions of the TPNW will establish an explicit legally binding prohibition for all states that ratify the Treaty. At the same time, one cannot help but feel somewhat underwhelmed by the lack of support for an explicit provision or reference banning all non-explosive tests under the wider ambit of the testing prohibition of art 1(1)(a).

VI THE UNDERTAKING NEVER TO ‘DEVELOP’ NUCLEAR WEAPONS AND ITS IMPLICATIONS FOR TESTING OBLIGATIONS

Despite the inconclusive and somewhat disappointing conclusion reached above regarding the extent of the testing prohibition under the TPNW, there remains a second way in which subcritical and computer simulated testing could potentially be captured by art 1(1)(a): through the undertaking never to ‘develop’

193 ‘Explanation of Vote by Sweden’ (n 184) 2.
196 Ibid 6.
nuclear weapons or other nuclear explosive devices. Whereas the prohibition on ‘testing’ certain weapons is generally a unique characteristic of nuclear weapons-related treaties,\(^{197}\) the prohibition of development is generally preferred in disarmament instruments prohibiting both chemical and biological weapons.\(^{198}\)

Despite this preference, the prohibition on developing nuclear weapons has not been incorporated consistently across different nuclear non-proliferation and disarmament instruments. The NPT prohibits NNWS from ‘manufacturing or otherwise acquiring’ nuclear weapons under art II, which only entails a narrow obligation covering the physical construction of a completed nuclear device.\(^{199}\) Although not prohibiting development, the Treaty of Tlatelolco does prohibit the ‘production’ of nuclear weapons.\(^{200}\) This term incorporates a broader scope than ‘manufacturing’ and has been viewed as including ‘not only manufacture (ie production in a factory) but also local improvisation or adaption of weapons’.\(^{201}\) Yet, as with the concept of ‘manufacture’, this would again fail to encompass earlier developmental steps, instead alluding only to the latter stages of the construction process.\(^{202}\)

However, some NWFZ treaties contain an explicit prohibition on the development of nuclear weapons. Under art 3(a) of the Treaty of Pelindaba, states party are required ‘[n]ot to … develop [or] manufacture … any nuclear explosive device’.\(^{203}\) The TPNW essentially takes a ‘catch-all’ approach under art I(1)(a) by establishing an undertaking never to ‘develop … produce, [or] manufacture … nuclear weapons or nuclear explosive devices’, thus following the formulation adopted in other conventional disarmament treaties such as the Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel

---

\(^{197}\) But see The Antarctic Treaty (n 36) art I(1), which includes a generic prohibition on the testing of all types of weapons.

\(^{198}\) See, eg, BWC (n 158) art 1; CWC (n 159) art I(1)(a).

\(^{199}\) NPT (n 2) art II. For those who support a narrower view of ‘manufacture’, see, eg, Daniel H Joyner, Iran’s Nuclear Programme and International Law: From Confrontation to Accord (Oxford University Press, 2016) 79–86; David S Jonas, ‘Ambiguity Defines the NPT: What Does “Manufacture” Mean?’ (2014) 36(2) Loyola of Los Angeles International and Comparative Law Review 263, 266–7. David S Jonas notes that a broader approach would entail construing a state’s intentions based on early steps, thus needing to go into the mind of a state, so to speak. For a contrasting approach endorsing a wider interpretation of ‘manufacture’, see Andreas Persbo, ‘A Reflection on the Current State of Nuclear Non-Proliferation and Safeguards’ (Non-Proliferation Papers No 8, EU Non-Proliferation Consortium, February 2012) 4–5.

\(^{200}\) Treaty of Tlatelolco (n 38) art 1(1)(a). Interestingly, the later Treaty of Rarotonga only prohibits the manufacture of nuclear weapons in a comparable way to the NPT: see Treaty of Rarotonga (n 38) art 3(a).

\(^{201}\) Casey-Maslen and Vestner (n 64) 37.


\(^{203}\) Treaty of Pelindaba (n 38) art 3(a). See also Treaty of Semipalatinsk (n 38) art 3(1)(a); Treaty of Bangkok (n 38) art 3(1)(a).
Mines and on Their Destruction\textsuperscript{204} and the Convention on Cluster Munitions.\textsuperscript{205} While this level of detail may be considered both excessive and unnecessary, it creates a welcome degree of overlap between each of the aforementioned concepts, thus helping to avoid any possible loopholes or ways to work around the prohibitions of development-related activities included under art 1(1)(a) of the TPNW.\textsuperscript{206}

Like the term ‘test’, the term ‘develop’ remains undefined by disarmament treaties but is ordinarily understood as to ‘create or produce especially by deliberate effort over time’\textsuperscript{207} or ‘to invent something or bring something into existence’.\textsuperscript{208} This would seem to suggest that ‘[a]ll acts that amount to, or are directed towards, development of the weapon or its integral parts and components are prohibited’.\textsuperscript{209} This definition immediately alludes to a vast array of potential activities that could be captured by the notion of development.

However, one preliminary matter relates to whether military ‘research’ into nuclear weapon-related technology would be captured under the auspices of the prohibition of development under art 1(1)(a) of the TPNW, despite its lack of explicit inclusion as an individual prohibition. In the present context, research is defined as ‘[t]he systematic investigation into and study of materials and sources \textit{in order to establish facts and reach new conclusions}'.\textsuperscript{210} The TPNW distinguishes between permitted and prohibited research by preserving the ‘inalienable right of its States Parties to develop research, production and use of nuclear energy for peaceful purposes without discrimination’,\textsuperscript{211} thereby reaffirming the right afforded by art IV of the NPT.\textsuperscript{212} Walter Krutzsch similarly argues that the term ‘develop’ under art I(1)(a) of the CWC encompasses ‘a number of steps for creating a functioning weapon ready for production, stockpiling, and use, \textit{as distinct from permitted research}’,\textsuperscript{213} therefore envisioning the possibility of some research and development activities associated with chemical materials remaining permitted. As such, so long as research and development activities by a state party do not, in any way, contribute towards any military application or advancement of nuclear weapon systems, peaceful research remains permitted under the TPNW.

However, given that individual prohibitions on both ‘research’ and ‘develop[ment]’ have been included as separate, though undoubtedly interconnected and overlapping, prohibitions by the Treaty of Pelindaba and the

---


\textsuperscript{206} As noted in relation to the Convention on Cluster Munitions: see Wiebe, Smyth and Casey-Maslen (n 202) 117.

\textsuperscript{207} Merriam-Webster (online at 30 September 2020) ‘develop’ (def 2b).

\textsuperscript{208} Cambridge Dictionary (online at 30 September 2020) ‘develop’ (v2, def 1).

\textsuperscript{209} Casey-Maslen and Vestner (n 64) 93.

\textsuperscript{210} Lexico (online at 30 September 2020) ‘research’ (n, def 1) (emphasis added).

\textsuperscript{211} TPNW, UN Doc A/CONF.229/2017/8 (n 12) Preamble para 21 (emphasis added).

\textsuperscript{212} NPT (n 2) art IV(1).

one may argue that both terms should be viewed as two separate actions operating in tandem, thereby suggesting a degree of autonomy between the two concepts. This seems to be the view taken by Krutzsch, who suggests that the prohibition of development in the context of the CWC only encompasses activities ‘from an advanced stage onwards’ with a clearly ‘defined and recognizable purpose’. Initial research activities may therefore be beyond the scope of the prohibition of development from this understanding, unless the purpose of such research would undermine the object and purpose of the TPNW.

Other commentators provide an alternative approach. Casey-Maslen and Vestner, for instance, argue that the term ‘development’ ‘refers to the stage of research prior to formal production of the weapon in question’ and, as a result, suggest that ‘[r]ealms form an integral part of the international legal concept of development’. Therefore, despite the apparent autonomy associated with the terms ‘research’ and ‘development’, the authors here view ‘research’ as just one example of the numerous activities that fall within the wider ambit of ‘development’. From this perspective, it can be reasonably argued that ‘[o]nce a state begins to develop a prohibited weapon, it violates that prohibition on development, irrespective of how advanced the design or research may be’. In essence, the ‘temporality’ condition of an ‘advanced’ stage of development suggested by Krutzsch is not necessary. Such a temporal requirement would ultimately ‘conflate the content of the prohibition with the means and ease of verification of compliance’. Rather, as soon as any particular research activity can be regarded as having a military, as opposed to peaceful, purpose, such an activity would be prohibited by the broader notion of development.

The travaux préparatoires of the TPNW would seem to demonstrate support for a wider construction of the term ‘develop’. First, during the TPNW negotiations, Austria considered ‘research’ and ‘design’ to be covered by the concept of development and warned that an explicit prohibition on research could unintentionally prohibit research into the peaceful application of nuclear energy and technology. Similarly, the ICRC suggested that including similar prohibitions to art 1(1) of the CWC, which includes a prohibition on development

---

214 Treaty of Pelindaba (n 38) art 3(a); Treaty of Semipalatinsk (n 38) art 3(1)(a).
215 Harald Müller has suggested that the TPNW also fails to prohibit research through a lack of a specific inclusion of a separate prohibition under art 1: Harald Müller, ‘The Future of the Non-Proliferation Treaty’ in Luciano Maiani, Said Abousahl and Wolfango Plastino (eds), International Cooperation for Enhancing Nuclear Safety, Security, Safeguards and Non-Proliferation: 60 Years of IAEA and EURATOM (Springer Open, 2018) 139, 144.
216 Krutzsch (n 213) 65 (emphasis added).
217 Casey-Maslen and Vestner (n 64) 37 (emphasis added).
218 Ibid 91 (emphasis added).
220 Ibid.
but not on research, ‘would suffice to achieve the purposes of the treaty to ban nuclear weapons’ and would be sufficiently ‘clear and robust’. 222 This understanding seemed to have been accepted, at least tacitly, as relatively little debate on the need for a separate prohibition on research activities followed thereafter. 223 Indeed, it is telling that Cuba, upon depositing its instrument of ratification, did not offer a comparable declaration clarifying the scope of the term ‘develop’ as it had done in relation to the term ‘test’. 224

In light of this broader interpretation of the prohibition on development under the TPNW, there is a strong case that both subcritical and computer simulated tests would be prohibited by art 1(1)(a). First, as briefly noted above,225 non-explosive experiments would help enhance our understanding of how a newly developed or qualitatively improved existing nuclear weapon would operate under certain conditions, and therefore help ascertain the expected result of its use and affirm the reliability of current stockpiles. 226 Both of these processes would undoubtedly constitute prohibited research experiments with the aim of ‘establish[ing] facts and reach[ing] new conclusions’ 227 as to the performance of both existing and newly designed nuclear explosive devices, contrary to both art 1(1)(a) and the underlying object and purpose of the TPNW as a whole.

There is also support for the inclusion of non-explosive testing activities within the prohibition on development based upon statements issued during the negotiations. Ireland, for example, explicitly argued that the notion of ‘development’ included in the TPNW text would encompass computer simulated tests. 228 Chile similarly expressed early concern over the inclusion of ‘test explosion’ and instead called for ‘a broader interpretation [recognising] that there is a prohibition of any kind of development of nuclear weapons’. 229 Indeed, Casey-Maslen has argued that

> ‘[t]hose opposing the explicit prohibition of subcritical nuclear testing were not seeking to prevent the 2017 Treaty from rendering the activity unlawful, but were concerned that the Treaty should remain consistent with the CTBT. But, as they argued, such subcritical testing is prohibited by the undertaking never under any circumstances to develop nuclear weapons or other nuclear explosive devices’. 230

---

222 International Committee of the Red Cross, Elements of a Treaty to Prohibit Nuclear Weapons, Agenda Item 8(b), UN Doc A/CONF.229/2017/WP.2 (31 March 2017) 2.
224 ‘Treaty on the Prohibition of Nuclear Weapons’ (n 190).
225 See above Part III(A).
226 As noted by Asada (n 18) 88.
227 Lexico (online at 30 September 2020) ‘research’ (n, def 1).
229 Patton, ‘News in Brief Vol 2(4)’ (n 150) 3.
230 Casey-Maslen, The Treaty on the Prohibition of Nuclear Weapons: A Commentary (n 76) 144 (emphasis added). Although Casey-Maslen refers solely to subcritical testing, it would not be entirely unreasonable to extend this logic to capture computer simulated research activities under the broad scope of the prohibition on developing nuclear weapons under art 1(1)(a) of the TPNW.
Overall, given the broad interpretation and scope of activities covered under the prohibition of development, and considering the research-oriented nature of both subcritical and computer simulated testing, it seems reasonable to conclude that non-explosive testing activities would likely be captured by the wider ambit of the prohibition of development under art 1(1)(a) of the TPNW, thus closing the testing ‘loophole’ established under the CTBT framework. Both activities are intended to improve a state’s understanding of how its nuclear weapons perform and help modify, and therefore develop, current nuclear weapons to extend their lifespan. This conclusion would also support the object and purpose of the TPNW in contributing towards, and ultimately achieving, nuclear disarmament.

VII TPNW ENTRY-INTO-FORCE PROSPECTS AND ITS RELATIONSHIP WITH THE CTBT

Having determined that the TPNW prohibits subcritical and computer simulated nuclear weapons tests within the undertaking never to develop nuclear weapons or other nuclear explosive devices in art 1(1)(a), the following offers some more pragmatic thoughts regarding the TPNW’s likelihood of entry into force, while briefly examining the future relationship between the testing prohibitions under the TPNW and CTBT.

A Entry into Force

The TPNW follows the trend of most other international treaties in terms of the requirements it sets for entry into force. In accordance with art 15(1), the TPNW ‘shall enter into force 90 days after the fiftieth instrument of ratification, acceptance, approval or accession has been deposited’. The benefit of this simple 50-state threshold is twofold. First, and most significantly, the TPNW negotiators have sensibly avoided repeating the flaw present under art XIV(1) and annex 2 of the CTBT by removing any requirement for specific types or categories of states — such as the NWPS — ratifying the instrument before it is able to achieve entry into force. This will help ensure that the TPNW does not replicate the failures of the CTBT, thereby making certain that the attainment of entry into force is not held hostage to the whim of just a few states.

Moreover, the benefits of this numerical threshold are made more obvious given the extensive opposition to the TPNW expressed by the NWPS and their strategic military allies. In July 2017, the UK, US and France issued a joint statement upon the adoption of the TPNW, which said:

France, the United Kingdom and the United States have not taken part in the negotiation of the treaty on the prohibition of nuclear weapons. We do not intend

---

to sign, ratify or ever become party to it. Therefore, there will be no change in the legal obligations on our countries with respect to nuclear weapons.233

This claim was repeated again in October 2018, this time with Russia and China joining in the statement.234 Russia has stated that the TPNW 'is at variance with Russia's national interests and ... vision of movement towards a nuclear free world'.235 India has also voiced similar concerns.236

Given this express opposition from the NWPS, the benefits of the simple numerical threshold of the TPNW — in contrast to the onerous requirements of art XIV(1) of the CTBT — become clear. While it would undoubtedly be desirable for the NWPS to support and eventually ratify the TPNW — particularly as these are the states most likely to conduct nuclear weapons tests — the collective unwillingness of the NWPS to ratify the TPNW will not disrupt or undermine efforts to achieve its entry into force. On the contrary, at the very least, a substantial number of non-aligned NNWS that support the Treaty will be legally bound by the broader testing prohibitions it establishes and the variety of other obligations imposed by the TPNW. Quite simply, the TPNW has the potential to realise and achieve a legally binding nuclear testing prohibition much sooner than the CTBT.

Secondly, the numerical threshold set by the TPNW affords a sufficient degree of credibility and helps demonstrate both the seriousness of the instrument and the international significance of the Treaty.237 Rather than setting a low standard that could easily be satisfied, the 50-state requirement sets almost a degree of challenge, which, if satisfied, will exemplify the legitimacy and widespread

---


237 Caughley and Mukhatzhanova (n 232) 20.
support amongst states for the \textit{TPNW}. Indeed, the threshold was raised from a lower 40-state requirement in the 22 May draft to the current threshold in the final text.\footnote{Draft Convention on the Prohibition of Nuclear Weapons, UN Doc A/CONF.229/2017/CRP.1 (n 178) art 16.} At the same time, by not requiring the significantly higher number of ratifications of 80 states as suggested by Sweden,\footnote{See Eva Walder, ‘Institutional Arrangements and Other Provisions’ (Speech, United Nations Conference to Negotiate a Legally Binding Instrument to Prohibit Nuclear Weapons, Leading towards Their Total Elimination, 31 March 2017) <https://reachingcriticalwill.org/images/documents/Disarmament-fora/nuclear-weapon-ban/statements/31March_Sweden-T3.pdf>, archived at <https://perma.cc/QD6X-9TZZ>-.} the \textit{TPNW} ensures that its entry into force will not be overly delayed, which would risk dissipating support for the instrument.

The prospects for entry into force in the near future seem very promising indeed. Key supporting states of the humanitarian initiative have already ratified the \textit{TPNW}, including Mexico and Austria (the hosts of the latter two humanitarian conferences),\footnote{See Daryl G Kimball, ‘Mexico Hosts Meeting on Nuclear Effects’ (2014) 44(2) Arms Control Today 33; ‘Vienna Conference on the Humanitarian Impact of Nuclear Weapons’, Federal Ministry for European and International Affairs (Web Page) <https://www.bmeia.gv.at/en/european-foreign-policy/disarmament/weapons-of-mass-destruction/nuclear-weapons/vienna-conference-on-the-humanitarian-impact-of-nuclear-weapons/>, archived at <https://perma.cc/XZ49-UNZN>-.} South Africa (a former NWPS that unilaterally abandoned its own nuclear weapon programme in 1989)\footnote{See Adolf von Baecckmann, Garry Dillon and Demetrius Perricos, ‘Nuclear Verification in South Africa: Verifying South Africa’s Declared Nuclear Inventory, and the Termination of Its Weapons Programme, Was a Complex Task’ (1995) 37(1) IAEA Bulletin 42.} and other supporters such as New Zealand.\footnote{New Zealand, for example, delivered a joint humanitarian statement on behalf of 155 states to the United Nations General Assembly First Committee in October 2014: see Higgie (n 136). Each state that has ratified the \textit{TPNW} so far supported this statement: see ‘Treaty on the Prohibition of Nuclear Weapons’ (n 190).} As of 30 September 2020, 46 states have ratified the \textit{TPNW}, the latest being Malaysia.\footnote{For details of the signature and ratification status of the \textit{TPNW}, see ‘Treaty on the Prohibition of Nuclear Weapons’ (n 190).}

Furthermore, the \textit{TPNW} is achieving a similar rate of ratification as other weapons of mass destruction disarmament instruments. The \textit{CWC} opened for signature on 13 January 1993, yet it was not until the ratification by Cuba on 29 April 1997, four years and three months after first opening for signature, that the \textit{CWC} entered into force.\footnote{For the ratification status of the \textit{CWC}, see ‘Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on Their Destruction’, United Nations Treaty Collection (Web Page) <https://treaties.un.org/pages/ViewDetails.asp?src=TREATY&mtndsg_no=XXVI-3&chapter=26>, archived at <https://perma.cc/5CF4-KV8J>-.} Similarly, the \textit{BWC} opened for signature on 10 April 1972, yet it was not until nearly three years later on 26 March 1975 that it achieved the 22 ratifications required for its entry into force.\footnote{For the ratification status of the \textit{BWC}, see ‘Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction’, United Nations Office for Disarmament Affairs (Web Page) <http://disarmament.un.org/treaties/t/bwc>, archived at <https://perma.cc/7QBS-XPSD>-.} The \textit{TPNW}, therefore, is achieving ratification at least at a comparable rate to other weapons of mass destruction disarmament instruments in force thus far.
Although some states present during the TPNW negotiations have since expressed an intention to not seek ratification of the Treaty as of yet,\(^\text{246}\) it seems probable that the TPNW will be ratified by at least the required 50 states. In fact, the art 15 threshold will easily be satisfied if just half of the states that voted in favour of the Treaty’s adoption decide to ratify the TPNW.\(^\text{247}\) Overall, prospects for the TPNW’s entry into force currently seem promising, and one can imagine that the Treaty will achieve legally binding status much sooner than the CTBT, thus imposing a legally binding prohibition on nuclear weapons test explosions and non-explosive activities for its states party.

B  Relationship with the CTBT

Perhaps a more pressing matter is precisely how the TPNW will operate in relation to the CTBT and whether the new treaty actually poses a threat to the attainment of the CTBT’s entry into force and the full operationalisation of its verification and monitoring mechanisms discussed previously. Indeed, in voicing opposition to the adoption of the TPNW, some NWPS have claimed that the Treaty risks undermining the existing nuclear non-proliferation and disarmament legal framework.\(^\text{248}\) The following seeks to explore and address the credibility of such concerns and determine whether the TPNW weakens the support and realisation of the CTBT regime.

It is prudent to note that the drafters of the TPNW went to great lengths to ensure that the Treaty would complement and strengthen the existing nuclear weapons international legal framework.\(^\text{249}\) The TPNW preamble makes this clear by emphasising the continued importance of the NPT as the ‘cornerstone of the nuclear disarmament and non-proliferation regime’\(^\text{250}\) and recognising the ‘vital importance of the Comprehensive Nuclear-Test-Ban Treaty and its verification regime as a core element of the nuclear disarmament and non-proliferation
This makes it clear that the negotiators did not intend the TPNW to detract from existing nuclear weapons instruments but rather to build upon, reinforce and complement both the NPT and CTBT.

How the TPNW will interact with existing nuclear weapons instruments in practice has created greater contention. The issue itself is covered by art 18, which states:

The implementation of this Treaty shall not prejudice obligations undertaken by States Parties with regard to existing international agreements, to which they are party, where those obligations are consistent with the Treaty.252

It became apparent during the 2017 Negotiation Conference that the relationship between the TPNW and the NPT specifically would create a point of contention among the negotiating states.253 The initial draft of this provision stated that ‘[t]his Convention does not affect the rights and obligations of the States Parties under the Treaty on the Non-Proliferation of Nuclear Weapons’.254 This formulation received strong support from the Netherlands, who wanted to ensure that the new treaty would not undermine the existing obligations under the NPT.255 Further, they sought to clarify the initial draft provision’s ‘hierarchy of agreements’, making it clear that in any case of conflict between the terms of the TPNW and NPT, the NPT obligations would prevail.256

However, it was feared that referencing the ‘rights’ of states party under the NPT might permit NWS to join the new treaty while retaining possession of their respective nuclear weapons.257 Daniel H Joyner, for example, notes how ‘[s]ome nuclear weapons states have for some time argued that the NPT gives them a “right” to possession and to further production and refinement of nuclear weapons’, an assertion he deems completely unsupported by the text of the NPT.258 Had the assertion of these states — that, by referencing ‘rights’, the NWS could accede to the TPNW whilst retaining nuclear weapons — been true, it would have certainly undermined the fundamental object and purpose of the TPNW in contributing towards the achievement of nuclear disarmament. Moreover, the text proposed in the initial draft was overly narrow, focusing solely on how the TPNW and NPT would interact in practice, whilst remaining quiet on the TPNW’s potential relationship with other agreements, including the CTBT.

251 Ibid Preamble para 19 (emphasis added).
252 Ibid art 18.
256 Ibid.
Consequently, both Joyner and some non-aligned NNWS called for the deletion of this article, arguing that its current form would leave room for ‘interpretive and implementation confusion’. In the end, based on a proposal made by Malaysia and endorsed by the ICRC, draft art 19 was revised, incorporating the corresponding text of art 26(1) of the Arms Trade Treaty into art 18 as it was finally drafted. This allows states party to continue to respect and lawfully implement their obligations established by pre-existing disarmament treaties, including both the NPT and CTBT, but only insofar as they are ‘consistent with’, and therefore do not ‘supersede[,] those set out in the [TPNW]’. In other words, in situations where there is a conflict of obligations between instruments, the TPNW obligations will prevail.

Newell Highsmith and Mallory Stewart have criticised this provision, arguing that it ‘subordinates the NPT to the [TPNW]’, a position that one could similarly apply in relation to the CTBT. Yet, in reality, art 18 simply reaffirms general rules of international law relating to treaties concerning the same subject matter. Articles 30(3) and (4) of the VCLT state that for parties to two instruments of the same subject matter, ‘the earlier treaty applies only to the extent that its provisions are compatible with those of the later treaty’. Article 18 of the TPNW essentially reflects this basic approach, thereby conforming to the lex posterior derogat priori general principle of international law, which the International Law Commission has confirmed ‘is at its strongest in regard to conflicting or overlapping provisions that are part of treaties that are institutionally linked or otherwise intended to advance similar objectives’.

Furthermore, this approach taken under art 18 of the TPNW is only logical and is indicative of the obligation of all states to perform their respective treaty commitments in good faith. Indeed, it would be counterintuitive if earlier, more limited obligations assumed under an existing treaty could prevail lex priori over...
the more stringent prohibitions contained in art 1 of the *TPNW*. Such an approach could even risk undermining the achievement of the *TPNW*’s object and purpose in achieving a nuclear weapon-free world and avoiding any future use of nuclear weapons, including for testing purposes. Instead, the general operation of the *lex posterior* principle through art 18 is ‘little more than a statement of common sense’, clarifying that the Treaty’s expansive obligations incorporated into art 1 cannot be derogated from by citing membership of a less restrictive nuclear weapons instrument as justification.

Given the conclusions reached in Parts IV and V, one can immediately identify a possible point of contention between the scope of the testing prohibitions under the narrower *CTBT* and the wider prohibitions within art 1(1)(a) of the *TPNW*. Indeed, during the 2017 negotiations, the Arms Control Association raised concerns that including a prohibition of subcritical and computer simulated tests (albeit directly under the prohibition of testing rather than development) could ‘reopen the issue of *CTBT* scope, and/or create a conflict with the *CTBT*’. As such, the fact that the *TPNW* establishes a broader scope of obligation in relation to testing than the *CTBT* may prima facie suggest that a conflict of obligations exists between the two treaty regimes.

At the same time, it can be argued that rather than creating a conflict of obligations or inconsistency, the *TPNW* in fact represents an ‘evolution’ of the pre-existing testing prohibition established by the *CTBT*. Indeed, one of the primary objectives of the *TPNW* is to strengthen and build upon pre-existing norms against nuclear weapons as a means of contributing towards nuclear disarmament and the elimination of all nuclear weapons. The evolution of the testing prohibition, therefore, does not necessarily clash with the *CTBT*, but rather, it incorporates the pre-existing prohibition of all nuclear explosive tests and subsequently goes one step further by also encompassing non-explosive activities. Consequently, rather than perceiving the difference in obligation between the *CTBT* and *TPNW* as an inconsistency or subordination as a result of the operation of art 18 of the *TPNW*, the broader testing prohibition of the *TPNW* should be conceived as a necessary, complementary and timely evolution in pursuit of nuclear disarmament.

Despite this suggestion of an evolutionary relationship between the *CTBT* and *TPNW*, a question does remain: given that the *TPNW* establishes a broader testing prohibition, are there any reasons why the *CTBT*’s entry into force should still be

---

269 Although this does not foreclose the application of *lex priori* elsewhere; see Study Group of the International Law Commission, *Fragmentation of International Law: Difficulties Arising from the Diversification and Expansion of International Law*, 58th sess, UN Doc A/CN.4/L.682 (13 April 2006) 122–5 [236]–[242].


271 Pedrazzi (n 148) 227–8.


pursued? In other words, does the simpler entry-into-force requirement and broader scope of the testing prohibition under the TPNW risk detracting from the CTBT? There are certainly some grounds for concern here. Marco Pedrazzi, for example, has noted the issue that states may be induced to ratify the TPNW either without ratifying the CTBT or by withdrawing their signature from the CTBT.274 Switzerland also suggests that the TPNW testing prohibition may risk further delaying the entry into force of the CTBT and may threaten to prevent the realisation of its extensive verification and monitoring framework.275 Other commentators have similarly argued that the adoption of the TPNW may encourage ‘forum shopping’,276 whereby states decide to ratify the TPNW while ‘opting out’ of existing instruments, including the NPT and CTBT. In essence, the adoption of the TPNW offers states the potential to choose between the different instruments currently in operation277 and risks further fragmentation of the nuclear disarmament framework.

However, this argument neglects three key points. First, no state has currently expressed an intention to leave existing nuclear disarmament treaties, including the CTBT, in favour of the TPNW.278 On the contrary, and as previously noted, numerous states have regularly argued that the TPNW will complement the existing regulatory structure.279 In fact, ban supporters frequently urge the remaining annex 2 states to ratify the CTBT as a matter of urgency.280 Moreover, should any NNWS decide to withdraw from either the NPT or CTBT, it is unlikely that the TPNW will be the ‘sole or even primary trigger for such developments’.281 Rather, it would likely be other reasons, such as frustration with the slow pace of disarmament and the inequality of the NPT, amongst other factors, which may lead NNWS to withdraw from existing commitments.

Secondly, and as noted previously, the TPNW preamble recognises the ‘vital importance of the Comprehensive Nuclear-Test-Ban Treaty and its verification regime as a core element of the nuclear disarmament and non-proliferation regime’.282 This clearly emphasises an intention of the negotiators to recognise the vital importance of achieving the CTBT’s entry into force and the

274 Pedrazzi (n 148) 228.
275 Dallafior (n 194) 2.
277 Erästö (n 249).
281 Erästö (n 249).
operationalisation of its extensive verification framework. In no way could the adoption of the *TPNW* therefore be considered a move against the *CTBT*. In fact, verifying compliance with the explosive testing prohibition under art 1(1)(a) of the *TPNW* can only occur in conjunction with the *CTBT* monitoring framework.

Finally, and perhaps most importantly, the *CTBT* has not yet entered into force due to the reluctance of the annex 2 ‘hold out’ states to ratify the agreement. Of these hold out states, six are current NWPS, with the DPRK, India and Pakistan not having even signed the *CTBT* thus far. Yet significantly, these very same hold out states are the ones expressing the greatest opposition to the *TPNW*. By contrast, and as noted above, the majority of non-aligned NNWS that supported the *TPNW* have already ratified the *CTBT* and have not indicated an intention to withdraw from the *CTBT*. As such, it is not the non-aligned NNWS that pose a threat to the future of the *CTBT* but rather the hold out NWPS, which are equally against the *TPNW* as they are against ratifying the *CTBT*. Consequently, it seems that the growth of support for the *TPNW* will not discourage efforts to promote *CTBT* entry into force and instead may provide additional reinforcement to the *CTBT*, which is held hostage by the remaining annex 2 states.

Overall, there is clear reason to believe that the effect of art 18 of the *TPNW* will allow the *TPNW* to harmoniously reinforce the *CTBT* without undermining the associated verification benefits gained from the *CTBT*’s entry into force. The broader testing prohibitions established by the *TPNW* simply expand upon and are an evolution of the earlier obligations under art I(1) of the *CTBT*. Yet this by no means replaces the importance of achieving the *CTBT*’s ratification, especially to realise the full operation of the *CTBT*’s extensive verification and monitoring framework discussed earlier. In addition, no *TPNW*-supporting NNWS has expressed any indication that the *TPNW* is viewed as a replacement of the *CTBT*; in fact, the only reason that the *CTBT*’s entry into force has been delayed is due to the lack of ratification by the NWPS and certain NNWS annex 2 states such as Egypt. In effect, the *TPNW* represents an additional layer of support to the prohibitions established by the *CTBT* and other obligations assumed elsewhere, thereby complementing existing testing prohibitions for present purposes.

**VIII CONCLUSION**

The adoption of the *TPNW* offers a welcome reinforcement of the international testing prohibition regime and helps complement the increasingly strained *CTBT*. The entry into force of the *CTBT* would of course represent a truly welcome development for current efforts towards nuclear disarmament, allowing the operation of the CTBTO verification framework as well as confirming a legally binding prohibition on all forms of testing. Yet pending such an event, the more achievable entry into force of the *TPNW* will provide various other benefits. First, it will create a legally binding prohibition on nuclear weapon test explosions, reflecting the prohibitions under art I(1) of the *CTBT*, which are not legally binding

---

283 See above Part III(C).
284 ‘Status of Signature and Ratification’ (n 99).
285 Pedrazzi (n 148) 228.
pending entry into force.\textsuperscript{286} Secondly, the \textit{TPNW} will close the ‘loophole’ of the \textit{CTBT} by prohibiting subcritical and computer simulated testing and thus impose broader, more restrictive obligations upon future states party. This clearly helps advance the object and purpose of both the \textit{TPNW} and the \textit{CTBT} in preventing nuclear proliferation and contributing towards nuclear disarmament.

Finally, the benefits of the \textit{TPNW} are not wholly deprived of value in light of the opposition expressed by the NWPS thus far. At a minimum, upon entry into force, the \textit{TPNW} will impose legally binding prohibitions of all forms of nuclear weapon testing upon its states party, the majority of whom will likely be NNWS. This will at least reaffirm the norm against nuclear non-proliferation and reinforce the growing norm and taboo against nuclear weapon testing. Although the NWPS remain the primary ‘targets’ of a testing prohibition, it would be incorrect to deprive the \textit{TPNW} of any meaning whatsoever, particularly as these states may, in the distant future, become more amenable to ratifying the ban treaty. In addition, the evolution of the nuclear weapon testing prohibition by no means detracts from the continued importance of achieving the \textit{CTBT}’s entry into force in order to realise the full potential benefits of its extensive verification framework. As such, the \textit{TPNW} does not attempt to replace the \textit{CTBT}, as many of the supporters of the Treaty and its preamble emphasise, but rather seeks to reinforce efforts to prohibit nuclear testing in a harmonious manner.

\textsuperscript{286} This is subject to the obligation not to defeat the object and purpose of the treaty under art 18 of the \textit{VCLT} as discussed in Part II(C). For any coexisting, parallel customary international law prohibition that may possibly exist, see above nn 17–18 and accompanying text.