Pugwash and the Future of Chemical and Biological Weapons Disarmament: Vision 2030 and Beyond

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Summary

Amid geopolitical tensions, threats of chemical and biological weapons, and rapid technological change, the Pugwash Conferences on Science and World Affairs has renewed its commitment to CBW disarmament through its reconstituted CBW Working Group. Building on its arms-control legacy, this paper examines priorities such as stronger institutions, verification, emerging science and technology, and international cooperation. It compares the challenges facing the Biological and Toxin Weapons Convention (BTWC) and the Chemical Weapons Convention (CWC). It considers how Pugwash's independent scientific engagement and policy initiatives could support both regimes ahead of their 2027 and 2028 Review Conferences.

Introduction

More than five decades after the Biological and Toxin Weapons Convention (BTWC) entered into force in 1975, and nearly three decades after the Chemical Weapons Convention (CWC) became operational in 1997, chemical and biological weapons continue to pose serious international security challenges. Allegations and confirmed instances of chemical weapons use, persistent compliance concerns, geopolitical tensions, and rapid advances in biotechnology, chemistry and artificial intelligence have exposed weaknesses in existing disarmament arrangements.

Against this background, the Pugwash Conferences on Science and World Affairs has reconstituted its Chemical and Biological Weapons (CBW) Working Group and launched 'Vision 2030 and Beyond', a program intended to contribute independent scientific analysis and policy proposals to the two disarmament regimes.[1] Drawing on Pugwash's longstanding engagement in CBW arms control,[2] the initiative focuses on institutional reform, verification, emerging technologies, and opportunities for international cooperation.

Pugwash's History and Renewed Engagement on CBW

Pugwash has been involved in chemical and biological arms control for almost seven decades.[3] Established in 1957 following the Russell-Einstein Manifesto of 1955, it brought scientists and policymakers together to examine the dangers posed by weapons of mass destruction, especially nuclear weapons.[4] At its first dedicated CBW gathering, the 5th Pugwash Conference (Pugwash, Nova Scotia, August 24-30, 1959), 26 scientists from Western and

Eastern bloc countries (at the height of the Cold War) assessed biological and chemical threats and proposed a permanent UN scientific commission to impartially investigate germ warfare allegations.[5] However, chemical and biological warfare were introduced into the discussions in subsequent years, leading to the establishment of a specialist study group that initially focused on biological warfare. The group first met in Geneva, Switzerland, in January 1965, and subsequently in Trieste, Italy, in April 1965.[6]

In subsequent years, the group examined biological warfare inspections and the difficulty of distinguishing legitimate research from prohibited military activity. Its work informed the UN Secretary-General's 1969 report on chemical and biological weapons and WHO's 1970 study of their health effects.[7] Pugwash experts later joined discussions on developing and implementing the BTWC and CWC. During the 1990s and early 2000s, the Pugwash CBW Study Group organized several workshops in Geneva (Switzerland), Noordwijk, and Oegstgeest (The Netherlands), providing an independent forum to examine assorted aspects of treaty regime development and implementation.

Challenges to CBW Disarmament

Despite the strong international prohibition, chemical weapons have been used in Syria, including the 2018 chlorine attack in Douma attributed by the OPCW to Syrian government forces.[8] More recently, the OPCW confirmed the presence of the riot-control agent CS in samples collected from Ukrainian battlefields in 2024-25, amid competing accusations of chemical weapons use by Russia and Ukraine.[9] In May 2025, the United States alleged that Sudanese government forces had used chemical weapons, prompting calls for an independent investigation.[10] These cases demonstrate continued chemical weapons use and the difficulties of investigation, attribution, and compliance.

Biological weapons bring their own set of challenges. Unlike the CWC, the BTWC has neither a dedicated international organisation nor a standing verification system. At the same time, synthetic biology, artificial intelligence, automated laboratories, and advanced chemical production are expanding legitimate scientific capabilities and creating new opportunities for misuse by both state and non-state actors.

Vision 2030 and Beyond

The Pugwash Vision 2030 and Beyond initiative proposes a sustained program of research, policy engagement and international dialogue to address these concerns. Its immediate priorities are organised around a rolling three-year program covering 2026-2028, with longer-term work intended to support the continued relevance of the chemical and biological weapons prohibitions.

BTWC

The August 2026 Pugwash briefing note on the BTWC identifies three interconnected priorities: institutional strengthening, verification, and science and technology assessment.[11] To address the treaty's longstanding institutional deficit, Pugwash proposes establishing a dedicated international organisation to coordinate technical expertise, manage compliance, and provide continuity between the review conferences. On verification, the note calls for redefining core parameters (*e.g., why, what, how, and who*) to integrate modern technical tools, transparency measures, and voluntary field exercises.[12] Finally, it highlights the need for a standing scientific assessment body to systematically monitor rapid advancements at the intersection of biotechnology, chemistry, AI, and

automation, ensuring treaty governance keeps pace with emerging security risks.

For Pugwash, these priorities are closely interrelated. Stronger institutions would support scientific assessment and verification, while deeper technical understanding could help governments develop more effective, realistic implementation measures.

CWC

The Pugwash approach to the CWC has evolved from the priorities discussed in a public webinar in October 2025, which included preventing the re-emergence of chemical weapons, promoting peaceful applications of chemistry, and addressing the legacy of past chemical weapons activities (e.g., old, abandoned, and sea-dumped chemical weapons). The November 2026 CWC briefing aims to develop three broader areas of work: evolving chemical threats, including industrial toxic chemicals, toxins and hybrid warfare; institutional governance, including the OPCW's scientific capabilities, workforce and international role; and the future of verification and investigations into alleged chemical weapons use. Together, these priorities reflect the need to maintain effective treaty implementation while responding to changes in chemical production, emerging technologies and the international security environment.[13]

Translating the Vision into Action

The revamped CBW Working Group helps shape Pugwash's research priorities and inform policy discussions. Its program combines expert meetings, scientific assessments, briefings, research papers, workshops, and engagement in BTWC and CWC processes. In 2026, the program renewed contacts with existing international networks and re-established ties with diplomatic communities and organisations in Geneva and The Hague. Its first BTWC briefing note, published and circulated at the BTWC meetings in Geneva (August 17-21, 2026), marked a step toward sustained treaty engagement.

With its renewed program established in 2026, Pugwash's immediate focus shifts to the two forthcoming treaty review conferences. The BTWC Tenth Review Conference in 2027 and the CWC Sixth Review Conference in 2028 provide opportunities to present research findings, examine technical proposals and contribute to discussions on institutional and verification reforms.

Pugwash plans to support these processes through policy research, briefings and expert workshops in Geneva and The Hague, bringing scientists, diplomats and specialists together to develop practical solutions beyond formal negotiations. It also aims to broaden Global South participation and engage young professionals through International Student/Young Pugwash and regional initiatives.[14] These efforts could turn Pugwash's 'Vision 2030 and Beyond' into contributions to both disarmament regimes. Their impact will depend on relevant, high-quality proposals and meaningful stakeholder engagement. While Pugwash can foster informed discussion, States Parties must decide on treaty reform and implementation.

Looking Beyond 2030

The longer-term relevance of Vision 2030 and Beyond will depend on whether its research and policy proposals contribute to practical improvements in the BTWC and CWC regimes. Political divisions, verification sensitivities and uneven scientific capacities will continue to complicate progress. Nevertheless, Pugwash's historical experience, the renewed CBW Working Group, and the international network offer

opportunities to develop independent proposals and sustain dialogue across political divides. By connecting scientific expertise with the evolving needs of chemical and biological disarmament, the program can help strengthen both conventions beyond their forthcoming review conferences.

Views expressed are of the author and do not necessarily reflect the views of the Manohar Parrikar IDSA or of the Government of India.

Endnotes:

1 Pugwash Conferences on Science and World Affairs, Chemical and Biological Weapons, https://pugwash.org/programmes/chemical-and-biological-weapons/

2 For a comprehensive history of Pugwash movement on CBW, See, J P Perry Robinson, "Background paper: Contribution of the Pugwash movement to the international regime against chemical and biological weapons", *Pugwash Meeting* No 242, Geneva, Switzerland, November 28-29, 1998. Accessible at the Harvard Sussex Program Web portal, http://hsp.sussex.ac.uk/new/_uploads/downloads/pugwash-hist.pdf

3 Named after Pugwash, Nova Scotia (Canada), where its inaugural conference was held in 1957, the organization was established to bring together prominent scientists across Cold War bloc lines to address the dangers of weapons of mass destruction, particularly nuclear weapons. The initiative was initially backed by Pugwash-born industrialist Cyrus Eaton, who financed the first gathering and several subsequent meetings.

4 Russell-Einstein Manifesto, *"Atomic Heritage Foundation"*.

5 Scientists from eight countries, including the United States, the United Kingdom, Canada, the USSR, France, Sweden, Denmark, and India attended the conference. The purpose of the conference was to assess the potential of chemical and biological agents as weapons and to explore possible means of preventing their production or use in war. The Sole Representative from India, Dr. M. L. Ahuja, Medical Adviser to the High Commission of India at India House (Aldwych, London) presented a paper titled "The Potentialities of Smallpox as A Biological Warfare Agent Against Man." See, Pugwash Conference of International Scientists on Biological and Chemical Warfare, Pugwash, Nova Scotia, Canada, August 24-30, 1959. (Conference document approx. 196 pages) is available with the author).

6 For detailed information on these early meetings and deliberations for possible inspection system for biological warfare preparation, see Pugwash Newsletter Vol. 2, No. 3, January 1965; Pugwash Newsletter Vol. 2, No. 4, April 1965; and "Pugwash XIV," *Bulletin of the Atomic Scientists*, Vol. 21, No. 7, September 1965, 41–45

7 Martin M Kaplan, "The efforts of WHO and Pugwash to eliminate chemical and biological weapons - a memoir," *Bulletin of the World Health Organization*, 77 (2) 1999

8 "Third Report by the OPCW Investigation and Identification Team Pursuant to Paragraph 10 of Decision C-Ss-4/Dec.3 "Addressing the Threat from Chemical Weapons Use: Douma (Syrian Arab Republic) – 7 April 2018," *OPCW*, January 27, 2023

9 "OPCW issues report on third Technical Assistance Visit to Ukraine following an incident of alleged use of toxic chemicals as a weapon", *OPCW*, June 26, 2025

10 "Imposing Measures on Sudan for its Use of Chemical Weapons", *Press Statement, US Department of State*, May 22, 2025

11 "The Biological and Toxin Weapons Convention: Vision 2030 and beyond," Pugwash Conferences on Science and World Affairs, August 24, 2026

12 Ibid.

13 The Pugwash CBW working group's CWC Brief is scheduled to be published during the 31st Session of the CWC Conference of the State Parties (CSP-31), 23-27 November 2026.

14 Currently, Pugwash Council member Jean-Pascal Zanders heads the CBW Program. He and Lizeka Tandwa coordinate the CBW Working Group (WG) comprising Pugwash members and specialists. Its broader network spans scientists, academics, policymakers, diplomats, industry professionals, and civil society representatives. The program also seeks greater participation from Africa, Asia, and Latin America, as well as from younger scientists and researchers.