SIPRI Research Policy Paper
March 2024

THE CENTRE FOR CHEMISTRY AND TECHNOLOGY AND THE FUTURE OF THE OPCW

IAN ANTHONY*

SUMMARY

● With the destruction of the final remaining stockpiles of declared chemical weapons in 2023, the Organisation for the Prohibition of Chemical Weapons (OPCW) must adjust to a new role. The inauguration of the OPCW's Centre for Chemistry and Technology (CCT) in 2023 provides a new resource to assist the organization and the international community in reducing and eliminating the threat from chemical weapons.

Now that the CCT is operational, it is important to build momentum behind a substantive programme of work. Projects for the programme could be grouped into four thematic categories: understanding technological developments; chemical forensics; broadening geographical representation; and tailored training programmes.

The CCT should be led by a director, who should work with a newly established Office of Science and Technology to develop the centre's strategic direction. To provide the CCT with stable and secure financing, a trust fund for the CCT should be established.

I. Introduction

The 1993 Chemical Weapons Convention (CWC) is the most successful disarmament treaty ever negotiated.[1] Its main original objective was accomplished in 2023 with the destruction of the final remaining stockpiles of declared chemical weapons under strict verification by the Organisation for the Prohibition of Chemical Weapons (OPCW), the CWC's implementing agency.[2] More than 72 000 metric tonnes of chemical agent have been destroyed since the convention entered into force in 1997.

Yet, while the states parties to the CWC all still declare their opposition to chemical weapons, they do not all live up to their commitment.[3] The CWC cannot survive in the long-term if there is impunity for chemical weapon use, but global cooperation to address confirmed cases has been made much more challenging by current political conditions. The divide among CWC states parties was made clear at the fifth five-yearly CWC Review Conference, in May 2023, when the states parties were unable to agree a final document codifying medium-term strategic guidance by consensus.[4]

However, the chair concluded that the conference was able to identify a number of common points on which to build agreement on some difficult issues.[5] Moreover, a subsequent medium-term plan for 2024–28 for the OPCW identifies priority areas that would have achieved consensus agreement just a few years ago and contains many potential lines of work.[6]

There is thus space for the CWC regime to take positive steps to adjust to its new role now that all declared chemical weapons have been destroyed: preventing their re-emergence. In particular, the inauguration of the OPCW's Centre for Chemistry and Technology (CCT) in 2023 provides a new resource to assist the organization and the international community in

[1] Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on their Destruction (Chemical Weapons Convention, CWC), opened for signature 13 Jan. 1993, entered into force 29 Apr. 1997.

[2] OPCW, 'OPCW confirms: All declared chemical weapons stockpiles verified as irreversibly destroyed', 7 July 2023.

[3] Anthony, I., *Strengthening Global Regimes: Addressing the Threat Posed by Chemical Weapons*, SIPRI Policy Paper no. 57 (SIPRI: Stockholm, Nov. 2020).

[4] 5th CWC Review Conference, Report, RC-5/3, 7 June 2023, para. 12.2.

[5] van der Kwast, H. C., 'Reflections on the fifth CWC Review Conference', eds J. Revill and M. Garzonmaceda, *Reflections on Review Conferences: The Non-Proliferation Treaty, the Biological Weapons Convention and the Chemical Weapons Convention* (UNIDIR: Geneva, 2023), p. 18.

[6] OPCW, Executive Council, 'Medium-term plan of the Organisation for the Prohibition of Chemical Weapons 2024–2028', Note by the Technical Secretariat, EC-104/S/1, 14 Aug. 2023.

The author is grateful to the Norwegian Ministry of Foreign Affairs, which generously provided funding for this project.

reducing and eliminating the threat from chemical weapons. Now that the CCT is operational, it is important to build momentum behind a substantive programme of work.

The CCT should aim to bring together knowledge in an inclusive way by setting priorities and designing programmes that bring together a bigger community. Programme priorities should be set in a way that builds relevant capacities in a global laboratory network expanded beyond the current list of OPCW-designated laboratories. Projects that build on the work of the OPCW Scientific Advisory Board (SAB) should create new opportunities for scientific research, including the involvement of industry.

After briefly addressing the achievements, problems and prospects for the CWC and the future of the OPCW (in section II), this research policy paper focuses on how the CCT can play its proper role (in section III) and proposes the outlines of a programme of work for the centre (section IV). It closes with recommendations for the OPCW on the operation of the CCT and more broadly (section V).[7]

II. The challenging context for chemical disarmament and the future of the Organisation for the Prohibition of Chemical Weapons

With the destruction of the final remaining stockpiles of declared chemical weapons in 2023, the CWC could be said to have effectively performed the main task that was set for it at the time it entered into force. This should have laid the foundation for the CWC states parties to take further measures to reduce chemical threats in a comprehensive way, but when they met at the fifth CWC Review Conference, in May 2023, expectations were low. The success of the CWC has been clouded because 'repeated [chemical weapon] use in the Syrian conflict, as well as the assassination attempts in the United Kingdom and Russia involving so-called Novichok nerve agents, have challenged the nonuse norm'.[8] Many delegates considered it essential that the conference's final document should make direct reference to the attribution of confirmed chemical weapon use, but a few resisted.[9] Differences on how to address chemical weapon use were so fundamental that delegates abandoned the attempt to agree on a final document in the morning of the final day of the Review Conference.

The ongoing challenge of chemical weapon use

Failing to uphold the norm against use of chemical weapons risks a gradual slide into the normalization of the possession of chemical weapons and

[7] The material on which this research policy paper has been based includes open-source documents; interviews conducted at the OPCW headquarters and in India and South Africa; and presentations and discussion at two workshops (December 2022 and November 2023) organized by SIPRI jointly with the Manohar Parrikar Institute for Defense Studies and Analyses in the framework of the research project.

[8] Kelle, A., 'The CWC at 25: From verification of chemical-weapons destruction to attribution of their use', *Nonproliferation Review*, vol. 28, nos 4–6 (2021), published 14 Apr. 2023, p. 320.

[9] 5th CWC Review Conference, General debate, Statement on behalf of Germany by Günter Sautter, federal government commissioner for disarmament and arms control, 24 May 2023.

acceptance of their use. It has been noted that 'There is a limit to which material differences among the major players in the OPCW can be papered over before the organization and Convention become ineffective in holding back proliferation and deterring significant use.'[10]

Confrontation between CWC states parties has been particularly acute over the documented use of chemical weapons in Syria. In five cases the OPCW has 'reasonable grounds to believe that the perpetrators of the use of chemical weapons were the armed forces of [Syria]'.[11] There are multiple other cases in which international bodies have found that chemical weapons have been used in Syria without attributing responsibility.[12]

Russia and Syria blocked the adoption of a consensus document at the fifth Review Conference over their objection to text attributing chemical weapon use to Syria.[13] However, later in 2023 the CWC Conference of the States Parties (CSP) underlined that the OPCW was still able to address the issue: a decision adopted by a vote of the CSP recommended that CWC states parties restrict the supply of certain chemicals and technologies to Syria and recommended affording the greatest measure of assistance possible in connection with criminal investigations or criminal proceedings relating to chemical weapon attacks in Syria.[14]

Alongside the Syria file there are several diverse allegations of chemical weapon use.[15] The most recent allegations of assassination attempts using chemical weapons have been directed at Russia, which is said to have used novichok nerve agents to poison Sergei and Yulia Skripal in 2018 and Alexei Navalny in 2020. Russia requested an OPCW technical assistance visit to address the allegations related to Navalny, but then withdrew the request and has rebuffed requests for a thorough explanation and a transparent investigation.[16]

Russia and Ukraine have traded allegations of chemical weapon use in their ongoing war. Intriguingly, in May 2023 a Russian TV channel seemed to report the use of riot control agents (RCAs) by Russian armed forces.[17] The CWC prohibits the use as a method of warfare of RCAs, which it defines as any chemical not listed in a CWC schedule that can rapidly produce in

[10] Caves, J. P. and Carus, W. S., 'Controlling chemical weapons in the new international order', Proceedings of the National Defense University Center for the Study of Weapons of Mass Destruction, Aug. 2022, p. 10.

[11] OPCW, Technical Secretariat, 'Accession of the Syrian Arab Republic to the Chemical Weapons Convention: Ten years on', S/2213/2023, 27 Sep. 2023, para. 40.

[12] United Nations, General Assembly and Security Council, United Nations Mission to Investigate Allegations of the Use of Chemical Weapons in the Syrian Arab Republic: Final report, A/68/663–S/2013/735, 13 Dec. 2013.

[13] French Ministry of Europe and Foreign Affairs, 'Chemical weapons—Fifth Review Conference of the Chemical Weapons Convention', 19 May 2023.

[14] OPCW, Conference of the States Parties, 'Addressing the threat from chemical weapons use and the threat of future use', Decision C-28/DEC.12, 30 Nov. 2023. The decision was adopted with 69 votes in favour, 10 against and 45 states parties abstaining. Reuters, 'Syria censured at global chemical weapons watchdog', 30 Nov. 2023.

[15] Su, F. and Anthony, I., *Reassessing CBRN Threats in a Changing Global Environment* (SIPRI: Stockholm, June 2019).

[16] On the OPCW's interactions with Russia over the alleged poisoning see OPCW, 'Case of Mr Navalny', [n.d.].

[17] OPCW, Executive Council, Note verbale from the permanent representation of Germany to the Technical Secretariat of the OPCW, EC-104/NAT.6, 6 Oct. 2023; and Channel 1, [Russian forces recapture the significant village of Spirne in the Donetsk People's Republic], *Vremya*, 2 May 2023, 1:50–2:05.

Box 1. The four result areas of the medium-term plan of the Organisation for the Prohibition of Chemical Weapons for 2024–28

Verification
The Organisation for the Prohibition of Chemical Weapons (OPCW) will continue to monitor converted chemical weapon production facilities to prevent the re-emergence of chemical weapon capabilities. It will also deepen its focus on developments in science and technology and the expanding global chemical industry to identify proliferation pathways and assist member states to block them.

Capacity development
A larger cohort of experts and officials will be needed to reduce the risks posed by toxic chemicals worldwide. The OPCW intends to expand the range of capacity building conducted using in-house expertise and to expand networks with other regional and international organizations. The expanded capacity should also contribute to more effective national implementation of the 1993 Chemical Weapons Convention (CWC).

External engagement
There is a great deal of expertise outside the OPCW that can be leveraged to support the CWC. The OPCW intends to develop deeper links to the science and technology community as well as the chemical industry. Engaging new partners is an essential element of addressing challenges arising from the rapid pace of technology development and making a contribution to global counterterrorism.

A small number of states remain outside the CWC, and preserving the capability to assist with the disarmament of yet undeclared chemical weapon stockpiles is also a priority. As well as retaining the knowledge from past demilitarization programmes, the OPCW will harvest the knowledge gained in non-routine missions and consider how it could be applied in a tailored way in future actions.

Organizational governance
Like any modern organization, the OPCW will conduct the assessment and reform processes needed to serve the needs of its stakeholders. Financial management and policies around human resources must equip the OPCW with the skills to address the needs of different world regions and industrial sectors.

Source: OPCW, Executive Council, 'Medium-term plan of the Organisation for the Prohibition of Chemical Weapons 2024–2028', Note by the Technical Secretariat, EC-104/S/1, 14 Aug. 2023, annex.

humans 'sensory irritation or disabling physical effects which disappear within a short time'.[18] Russia was subsequently asked to clarify whether the report was true and whether any active investigation of the circumstances was being undertaken. The Russian response was that the items used were smoke grenades and incendiary ammunition that are not prohibited by the CWC.[19] The use of any chemical weapon in combat would be a serious development. Setting aside the fact that RCAs can be lethal, depending on the context and manner of their use, their use with impunity would increase the risk that other chemical weapons would return to a high-intensity battlefield.

A future orientation for the Organisation for the Prohibition of Chemical Weapons

The OPCW long ago asserted the need to shift its focus 'from disarmament of chemical weapons to preventing their re-emergence'.[20] This includes the need for 'investments in a widening range of activities related to verification,

[18] CWC (note 1), articles I(5) and II(7).
[19] OPCW, Conference of the States Parties, Statement of Germany under agenda item 9(d), 29 Nov. 2023.
[20] OPCW, Technical Secretariat, Office of Strategy and Policy, 'The OPCW in 2025: Ensuring a world free of chemical weapons', S/1252/2015, 6 Mar. 2015, para. 1.

capacity development, stakeholder engagement, and governance of the Organisation'.[21]

However, documented use of chemical weapons undoubtedly hinders the focus on a future orientation for the OPCW.[22] Resolution of this fundamental challenge to the CWC is a precondition for reaching consensus around strategic documents. However, even in the absence of such a resolution, expert observers have concluded that there is still scope for constructive and valuable cooperation under the convention.[23] Indeed, there are substantial points of agreement that are broadly consistent with an agenda for change.[24]

The OPCW Technical Secretariat has been able to elaborate a medium-term plan describing activities to be undertaken prior to the sixth Review Conference, in 2028.[25] The plan lays out seven core objectives for the coming five years, organized in four broad areas: verification, capacity development, external engagement and organizational governance (see box 1).[26] A new locus of OPCW activity that brings together aspects of all four of these areas is the newly inaugurated Centre for Chemistry and Technology, which is the focus of the rest of this paper.

III. Maximizing the contribution of the Centre for Chemistry and Technology

In 2017 the OPCW began exploring a replacement for its laboratory and equipment store, which was more than 20 years old and no longer had the space or capacity to support the future work of the organization. In May 2023 the new Centre for Chemistry and Technology was inaugurated to retain the functions of the existing laboratory but also open new possibilities. The OPCW described the CCT as 'an important upgrade to the OPCW's capabilities to adapt to the evolving global security landscape and assisting Member States in upholding the global norm against chemical weapons'.[27]

The centre will continue to process and store samples collected from OPCW missions and to manage the relationships with designated laboratories that carry out sample analysis, including conducting proficiency tests and assessing laboratories seeking to join the network. It will also continue to house the equipment used in field operations and train inspectors in its use. However, as well as ensuring continuity, the CCT is expected to facilitate new training and capacity-building programmes and support high-level research in the near term.[28]

At the outset the CCT should ensure that existing tasks are performed in a competent manner, as envisaged in the OPCW's programme and budget for

[21] OPCW, S/1252/2015 (note 20), para. 1.

[22] OPCW, S/2213/2023 (note 11).

[23] E.g. Guthrie, R., 'The closing of the fifth Review Conference and some reflections', CWC Review Conference Report no. 6, 30 June 2023.

[24] OPCW, 5th Review Conference, Report by the chairperson of the open-ended working group for the preparation of the fifth Review Conference, RC-5/WP.9, 15 May 2023.

[25] OPCW, EC-104/S/1 (note 6).

[26] OPCW, EC-104/S/1 (note 6), annex.

[27] OPCW, 'OPCW Centre for Chemistry and Technology officially inaugurated', 12 May 2023.

[28] OPCW, Conference of the States Parties, 'Programme and budget for the OPCW for 2024–25', Decision C-28/DEC.9, 29 Nov. 2023, p. 10.

2024–25.[29] However, over time, the centre should become more ambitious. The remainder of this section discusses possible ways in which it could develop in order to meet the expectations that have been placed upon it.

Expectations include assessing threats and opportunities that arise from rapid progress in science and technology and providing a platform to better coordinate efforts between scientists, academia, civil society, industry and relevant international organizations.[30] However, the centre can only deliver on the expectations with stable and predictable funding, and that funding should support a multi-year programme of work.

Sustaining support for the future development of the CCT requires active diplomacy and a strategy for outreach. A step-by-step approach should be taken to expanding the scope of CCT activities; this is partly due to pragmatism, given the availability of resources, but would also be a way of instilling confidence in representatives of states parties—including those that do not necessarily focus exclusively on chemical weapon issues—that progress is being managed in a responsible way. To that end, the OPCW conducts regular briefings on progress in developing the CCT.[31]

The level of knowledge in industry about developments in the framework of the CWC also needs to be raised in a step-by-step manner. An enhanced dialogue with industry needs to address the concern that revising the approach to CWC verification will not impede legitimate and peaceful activities. Framing issues in a way that achieves cooperation with industry, including on measures that companies might not see as in their immediate interest, requires a new dialogue based in part on analysis of technology development.

The disarmament community and industry have a mutual interest in avoiding any 'strategic shock' from something that is not considered a chemical weapon in the traditional sense. New methods, including the use of artificial intelligence and machine learning, are expected to increase the diversity of chemicals that could be used against the purposes of the CWC.[32]

Based on the above points, a method for determining the work carried out at the CCT could have three elements. The first would be a procedure by which states parties, the Technical Secretariat and the OPCW subsidiary bodies (the SAB and the Advisory Board on Education and Outreach, ABEO) can put forward project proposals. The second element would be building a trust fund that would be at the disposal of the OPCW to finance projects that fit within an agreed framework. The third would be a procedure for project selection in which the Technical Secretariat matches proposed projects to the funding available in the trust fund.

Rethinking internal relationships in the Technical Secretariat

The CCT falls within the scope of the Technical Secretariat under the authority of the director-general of the OPCW; it was not created as a separate or autonomous entity. The centre is expected to be a cross-cutting resource: in

[29] OPCW, C-28/DEC.9 (note 28).

[30] OPCW, EC-104/S/1 (note 6).

[31] OPCW, Technical Secretariat, 'Progress in the project to upgrade the OPCW Laboratory and Equipment Store to a Centre for Chemistry and Technology', S/2193/2023, 29 July 2023, para. 3.

[32] Saeed, A. et al., 'Artificial intelligence-assisted chemistry', *Chemistry International*, vol 45, no. 3 (July–Sep. 2023).

order to reduce the risk of activities being stove-piped, it does not belong to any of the existing OPCW divisions.

The CCT has a manager responsible for the efficient running of the facility, but not a director with more autonomy to develop a strategy and shape a future work programme. Moreover, while the OPCW director-general has a number of offices that provide advice and assistance, including an Office of Strategy and Policy, there is no dedicated Office of Science and Technology (OST).

An OST working closely with a director of the CCT might be a way to bring together the internal knowledge inside the OPCW without making any existing division first among equals. The OST would provide an obvious point of contact for communication with CWC states parties about the CCT and a natural interlocutor for other subsidiary bodies that are directly connected to the director-general (i.e. the SAB and the ABEO). The OST could be staffed with subject matter experts such as the dedicated adviser on chemical forensics that the SAB recommended be recruited to the staff of the director-general.[33]

Designing a programme of work

In its initial phase the CCT is hosting events already planned as part of the OPCW calendar, such as an analytical chemistry course for women chemists and a training course on investigation of incidents involving toxic industrial chemicals. The new building is also being used for inspector training and laboratory proficiency testing.

As the expectation is that the CCT will promote more activities and programmes, a procedure for project selection could be built around the broad understanding that already exists about how the centre should be used. Themes that suggest themselves include (*a*) understanding technological developments that can produce risk; (*b*) broadening the geographic representation in a structured laboratory network that goes beyond OPCW-designated laboratories; (*c*) training programmes tailored to the needs of different regions and different stakeholders; and (*d*) building knowledge in new scientific disciplines, such as chemical forensic analysis.

To ensure broad support for the future development of the CCT, the Technical Secretariat will be expected to take a lead in drafting proposals as a basis for discussion with states parties. A regular consultation procedure would provide states parties with an opportunity to comment on plans and put forward additional or alternative projects and ideas. Once agreed, plans would be supported financially either by individual project financing or in another way, for example using a trust fund. On an as-needs basis, other participants (e.g. the SAB, the ABEO, laboratory representatives and industry associations) could also be present at the consultation meetings. The objective should be to arrive at an agreed catalogue of projects supported by secure multi-year funding.

[33] OPCW, Scientific Advisory Board, Summary of the third meeting of the temporary working group on investigative science and technology, SAB-28/WP.3, 4 June 2019, para. 5.2. Chemical forensics is discussed further below.

Stable and secure financing

The CCT was built using a trust fund—the ChemTech Centre Trust Fund—with an initial budget of €33.5 million that relied exclusively on voluntary contributions. This trust fund remains open, and the contributions it continues to receive will pay for the upkeep and running of the facility. However, it does not address how a CCT programme of work will be financed.

The European Union (EU) and its member states paid roughly half of the cost of building the centre, and the EU and the United States together paid for two-thirds. Including contributions from Canada, Japan and the United Kingdom, the share rises to 95 per cent of the total cost of building the CCT.[34] To obtain the best return on their investment, the OPCW Group of Western European and Other States (WEOG) together with the EU should take a special interest in ensuring the centre's future success.

There are three ways in which a programme of work for the CCT could be funded.

The first would be to use the CCT to implement projects that are the responsibility of the different OPCW divisions. This might be administratively efficient because the financial management and oversight tasks are already anticipated. However, it establishes a passive role for the CCT and does not develop the cross-cutting agenda that was expected to be part of the value that it added.

A second approach would be to finance the work of the CCT separately from the substantive divisions under an Office of Science and Technology reporting to the director-general. This would form part of Executive Management within the regular OPCW budget. This approach would help to avoid the 'capture' of the CCT by an existing division and help promote horizontal cooperation across the OPCW, including its subsidiary bodies (particularly the SAB and the ABEO). With the decision to move from annual budgeting to a biennial programme and budget from 2022–23, this approach would provide an element of stability and continuity.[35] The regular budget would allow for longer-term staff appointments. The CCT would also become part of the comprehensive review of the OPCW budget, increasing transparency and perhaps also promoting greater engagement. However, in a period of zero growth in the OPCW budget and considering that a number of existing programmes remain unfunded, it does not seem that states parties favour this approach.

A third approach would be to create a new trust fund (or adapt the existing one) to support the substantive work of the CCT. Financing the activities at the centre through voluntary funds would run the risk that donors dictate the details of projects, running counter to the widespread understanding that the centre is valuable to the whole CWC community. To counteract this, the new fund could be modelled on the fund established to support the SAB. The SAB Trust Fund receives voluntary contributions that the director-general is authorized to allocate for SAB activities not covered by the regular OPCW

[34] OPCW, 'Centre for Chemistry and Technology', [n.d.].

[35] OPCW, Conference of the States Parties, 'Transition of the OPCW to a biennial programme and budget', Decision C-24/DEC.11, 28 Nov. 2019.

programme and budget. A condition of the voluntary support is that no donor may place restrictions on how the OPCW uses contributions to the fund.[36]

Sponsors have begun to make financial contributions that support the CCT by pledging money to projects that will be implemented at the centre. It appears that a balance has been found between donor oversight and flexibility in how funds are employed. The USA has pledged to contribute $1 million to support capacity-building and training projects at the centre.[37] In June 2023 the USA agreed to finance a collaboration between the OPCW and the US Defense Threat Reduction Agency (DTRA) to work on analytical forensic methods, biotoxin analysis, equipment-validation capabilities, training of inspectors, and developing e-learning courses in chemical safety and security.[38] However, these activities must be implemented by existing staff and do not increase overall capacity.

In a decision to enhance OPCW operational effectiveness, the EU specified that some of the activities that it supported were to focus on using the CCT to provide a platform for 'broader engagement on capacities and peaceful uses of chemistry'.[39] These activities were to include 'laboratory twinning, laboratory trainings, scientific research (e.g. developing forensic lab methodologies); enhancing OPCW's readiness to address progress in science and technology including through the implementation of selected priority recommendations from the OPCW Scientific and Advisory Board; and enhancing OPCW's operational capacities for mission preparations and deployments such as testing, validation and training of new technologies/equipment'.

While such sponsorship of projects during the first phase of developing the CCT is essential, it has a somewhat ad hoc character. In the medium term, it cannot be a substitute for a more strategic approach. That requires a coherent programme of work for the centre.

IV. Indicative projects for the programme of work of the Centre for Chemistry and Technology

Projects for a full programme of work for the CCT could be grouped into four thematic categories: understanding technological developments; chemical forensics; broadening geographical representation; and tailored training programmes. A number of projects have already been proposed as part of the first phase of the CCT's work, and some of these are already being developed further with a view to implementation.[40]

[36] OPCW, Technical Secretariat, 'Operating rules for the Trust Fund for the Scientific Advisory Board', annex to S/563/2006, 13 Apr. 2006, para. 4(b).

[37] 5th CWC Review Conference, Statement by Bonnie Jenkins, US under secretary of state for arms control and international security, 12 May 2023.

[38] OPCW, 'New collaboration arrangement between OPCW and US Defense Threat Reduction Agency', 3 July 2023.

[39] Council of the EU, Council Decision (CFSP) 2023/1344 of 26 June 2023 in support of enhancing the operational effectiveness of the Organisation for the Prohibition of Chemical Weapons (OPCW), *Official Journal of the European Union*, L 168, 3 July 2023, annex, section 3.

[40] OPCW, Conference of the States Parties, Open Forum, 28 Nov. 2022.

Understanding technological developments

Among technological developments, the SAB has drawn attention to the potential risks posed by toxins, the need to recognize their use in acts inconsistent with the CWC and the need for a capability to investigate alleged incidents.[41] Academic studies have also drawn attention to the problems that future research may raise for the CWC since novel toxins derived from poisonous plants and animals have the potential to be weaponized, including the possible use as 'less-lethal' weapons.[42]

Projects organized at the CCT might support short- and long-term science and technology foresight tailored to the needs of the CWC. For example, identifying chemicals that are difficult to detect using existing equipment or that resist decontamination methods. The risk that traditional chemical weapon production processes based on precursors might be replaced by synthetic pathways that bypass traditional manufacturing methods would create new verification challenges.[43] Exploring technology that can develop, test and validate equipment to help inspectors and enhance inspection options, including in non-permissive environments, might be a route to a role for the CCT in designing inspection instruments and methodologies.

A 2023 report prepared by a temporary SAB working group recommended steps in biotoxin analysis and investigations of their alleged use as weapons that would strengthen the CWC.[44] The recommendations in the report will be taken forwards, and the CCT could be instrumental in following up on some of them.[45] For example, the CCT could help to identify laboratories with specialized capabilities for analysis of the nine biotoxins considered to be the 'most relevant' to the purposes of the CWC (only two of which are currently included in CWC schedules).[46] The project would be consistent with the ambition of the CCT to widen collaboration beyond the existing network of designated laboratories.

Chemical forensics

Chemical forensic analysis is an important new tool at the disposal of investigators. If hazardous materials may have been used in a criminal act, forensic science—the scientific examination of evidential material and the interpretation of its results to shed light on hypotheses that are relevant in a legal case—helps to identify material outside regulatory control, establish the legitimacy of possession and connect illicit material to individuals by reconstructing the process history. When combined with other information, a chemical forensic analysis can help identify the perpetrator of an act or exclude certain actors from suspicion of involvement. It is an emerging field:

[41] OPCW, Scientific Advisory Board, 'Analysis of biotoxins', Report of the SAB's temporary working group, SAB/REP/1/23, Apr. 2023.

[42] Crowley, M. and Dando, M., 'Toxin and bioregulator weapons: Preventing the misuse of chemical and life sciences', Written submission to the 5th CWC Review Conference, May 2023.

[43] OPCW, Executive Council, Opening statement by the director-general, EC-104/DG.9, 10 Oct. 2023, para. 18.

[44] OPCW, SAB/REP/1/23 (note 41), paras 13–35.

[45] OPCW, Executive Council, 'Response to the report of the thirty-seventh session of the Scientific Advisory Board', Note by the director-general, EC-104/DG.22, 27 Sep. 2023, para. 8.

[46] OPCW, SAB/REP/1/23 (note 41), para. 15.

an international technical working group has been engaged in developing chemical forensic analysis since 1995.[47]

Several states parties have drawn attention to the role chemical forensics can play in adapting the CWC verification regime.[48] In advance of the fourth CWC Review Conference, in 2018, the SAB pointed the way forwards in building knowledge about chemical forensics.[49] A temporary SAB working group considered how to gather information and understand capabilities within the field, and in 2019 it recommended ways in which the issue could become embedded in the OPCW.[50]

As noted above, in 2023 the CSP recommended that states parties support criminal investigations or proceedings in alleged cases of chemical weapon use.[51] France, Germany and Sweden are investigating the role individuals played in the Syrian chemical weapon programme as they consider prosecuting crimes of universal jurisdiction, including the use of chemical weapons.[52] Canada and the Netherlands have also filed a joint application at the International Court of Justice to initiate proceedings against Syria.[53]

The science of chemical forensics could play an important role in a range of non-routine OPCW missions, but it is perhaps most likely to be called upon following a criminal action or a possible chemical weapon terrorism incident.

A court case might only be brought several years after the alleged incident and samples of chemical agent from a crime scene might decay during the pre-trial period. Preserving the samples might therefore not make sense because they may no longer be valuable as evidence. In such cases a court may have to work from forensic evidence that is not preserved in physical form. Preparing case reports (findings, interpretations and conclusions) in a way that allows the prosecutor to use the evidence gathered, that respects the rules of evidence in the particular jurisdiction and that a prosecutor is willing to provide to the defence, who must be able to challenge its contents, is therefore an important and necessary discipline. In jurisdictions where physical evidence is required by a court, technical advances may help to carry out decontamination in a way that preserves the 'markers' in a sample that make it valuable as evidence while meeting health and safety requirements.

The OPCW should build its own understanding and skills base around chemical forensic analytical methods in case it is called on to assist a state party in an investigation. In 2023 the CCT hosted a specialized course on preventing the use of chemical weapons and toxic industrial chemicals

[47] US Department of State, 'Chemical forensics international technical working group', [n.d.].

[48] 5th CWC Review Conference, 'Strengthening verification through the promotion of chemical forensics at the OPCW', Submitted by Finland, Sweden and the United Kingdom, 28 Apr. 2023.

[49] OPCW, Scientific Advisory Board, 'Report of the Scientific Advisory Board's workshop on chemical forensics', SAB-24/WP.1, 14 July 2016.

[50] OPCW, Scientific Advisory Board, 'Investigative science and technology', Report of the SAB's temporary working group, SAB/REP/1/19, Dec. 2019.

[51] OPCW, C-28/DEC.12 (note 14).

[52] E.g. Triscone, J., 'Universal jurisdiction, the only hope for prosecuting international crimes committed in Syria?', Trial International, 6 Sep. 2021; Open Society Justice Initiative, 'Universal jurisdiction in Sweden: Victims of Syria's chemical weapons attacks demand justice', 20 Apr. 2021; and International Federation for Human Rights, 'France: The Court of Cassation confirms the jurisdiction of French courts in two Syrian cases', 12 May 2023.

[53] Agence France-Presse, 'Netherlands, Canada take Syria to International Court of Justice over torture claims', France24, 12 June 2023.

from a law enforcement perspective.[54] This suggests that the CCT's work on chemical forensic analysis will not be linked exclusively into a traditional definition of chemical weapons. Furthermore, by building its own skills base, the OPCW can help states parties increase their own knowledge and understanding.

Cooperation with partners could help the CCT to support the prosecution of terrorist crimes. The OPCW has its own training package that is compatible with the approach used by the United Nations Interregional Crime and Justice Research Institute (UNICRI). UNICRI could deliver training at the CCT, including lessons learned from cases that have been prosecuted drawing on UNICRI's *Prosecutor's Guide to Chemical and Biological Crimes*.[55] The OPCW should take part in relevant initiatives, such as the forensic laboratory network of the International Criminal Court (ICC), as well as building operational support to law enforcement bodies such as International Criminal Police Organization (Interpol) over time.[56]

A database of samples is essential in forensic analysis in order to match identified markers in a sample with the specific characteristics of products. The OPCW has built a central analytical database of chemicals based on the lists of chemicals in the CWC schedules.[57] However, whether a database of information relevant to chemical forensics could be incorporated into a modified version of the existing database or should be developed separately is currently under discussion.[58]

The CCT could help the OPCW to become a key convener. Not only could it bring together laboratories with relevant expertise in forensic analysis, but it could also extend the collaboration to bring in all elements of the process of investigation, evidence generation and support to law enforcement.

Broadening geographical representation

The chemical industry is relocating to the Global South, partly for cost reasons.[59] In order to regulate, monitor and effectively control, a collaborative relationship is needed between the host countries and industry.

While the OPCW has an existing network of designated laboratories, there is no intention to limit cooperation to them. The CCT can play a role within international laboratory networks by leveraging activities already undertaken in other laboratories, fostering collaboration and capacity building, and helping to provide specially tailored training for different regions according

[54] OPCW, 'OPCW trains law enforcement professionals in chemical emergency investigation techniques', 26 Nov. 2023.

[55] UN Interregional Crime and Justice Research Institute (UNICRI), *A Prosecutor's Guide to Chemical and Biological Crimes* (UNICRI: Turin, 2022).

[56] The Office of the Prosecutor of the ICC convenes representatives of the international forensic science community during the annual meeting of the ICC Scientific Advisory Board. International Criminal Court, 'The Scientific Advisory Board of the Office of the Prosecutor holds its 6th annual meeting', 4 July 2019.

[57] OPCW, Conference of the States Parties, 'Central Analytical Database', Decision C-I/DEC.64, 22 May 1997.

[58] 5th CWC Review Conference, 'Strengthening verification through the promotion of chemical forensics at the OPCW', Submitted by Finland, Sweden and the United Kingdom, RC-5/WP.1, 28 Apr. 2023.

[59] Lang, N. et al., *Duelling with Dragons 2.0: The Next Phase of Global Corporate Competition* (Boston Consulting Group: Boston, MA, June 2015).

to their needs. Technical universities and the facilities owned and operated by the chemical industry should be part of that international cooperation.

At the OPCW annual workshop to discuss international cooperation, participants specifically noted the importance of the CCT.[60] However, the most dynamic international discussions take place in networks adjacent to the issue of chemical weapons—such as those that focus on the safe use of chemicals, environmental safety and criminal activities involving explosives.[61] These are discussions that engage with and influence the chemical industry, including in regions where it is rapidly expanding. The OPCW should be active in such networks.

The OPCW helps states to prepare in case activities related to legitimate use of chemicals in industry, agriculture, research or medicine are exploited maliciously. Moreover, it is legal to develop effective means of protection against toxic chemicals and chemical weapons. Article X of the CWC anticipates the coordination and delivery of detection equipment and alarm systems; protective equipment; decontamination equipment and decontaminants; medical antidotes and treatments; and advice on any of these protective measures. The OPCW could bring the knowledge that it has gained from activities to promote effective assistance and protection related to chemical weapon use into the international discourse around responding to industrial accidents and the misuse of chemistry. The OPCW can help to enhance chemical safety and security at local, national and regional levels around the world by hosting at the CCT participants from across the UN frameworks that include goals for sustainable development and environmental protection.

The promotion of regional centres of excellence to help states implement initiatives that are difficult to sustain nationally has been under discussion in the past decade.[62] The CCT could move the idea forwards as an element of international cooperation. A set of regional projects that include officials as well as regional industry associations could help relatively new entrants into the chemical industry and countries that are welcoming relocated chemical plants to draft a comprehensive regulatory framework for chemical security as well as chemical safety.

As part of an expanded OPCW network, a young scholars programme would be a way to attract a new generation of experts into the chemical weapon field. The OPCW already manages a fellowship programme to provide scientists and engineers with opportunities to gain work experience in laboratories in the territory of other states.[63] A young scholars programme would be a logical adjunct, including early-stage scientists in research projects coordinated under the OPCW.

Tailored training programmes

To enhance the preparedness of the Technical Secretariat to conduct all types of mission, the CCT can build an internal training programme that includes

[60] OPCW, 'Annual workshop reviews progress in implementation of Article XI', 19 Dec. 2022.

[61] E.g. United Nations, 'Countries urged to take more action against chemical pollution', UN News, 1 May 2023.

[62] 5th CWC Review Conference, Statement by Algeria, RC-5/NAT.12, 15 May 2023.

[63] OPCW, 'Capacity building: Fellowship programme', [n.d.].

operating in semi-permissive environments. It could then conduct exercises to test the capability using realistic and relevant scenarios. In that way, the OPCW can capture the past experience from non-routine missions and use it to assist states.

The OPCW international capacity-building programme is a unique resource that assists states to implement their obligations.[64] International cooperation and training is a hidden success of the OPCW, which already hosts or organizes a range of technical workshops. The CCT should provide new opportunities to work with regional bodies. A series of projects focused on emergency response to a chemical incident based on realistic scenarios and tailored to the conditions in different regions would be a valuable addition to the CCT's portfolio of training events.

Enhancing protection and response capabilities against chemical incidents and attacks is one of the objectives for the OPCW Africa Programme. In 2023 the OPCW and Algeria together organized CHEMEX Africa, the first large-scale chemical emergency response exercise for African countries.[65] Another objective of the Africa Programme is to advance chemical safety and security culture, standards and practices in Africa by supporting regulators developing national frameworks for chemical safety and security management. A project portfolio developed under the auspices of the OPCW Africa Programme and the CCT could become a focal point for assisting the African chemical industry to build resilience.[66]

The ABEO could be engaged in a project to develop a curriculum on the ethics of chemistry that could be considered by technical universities as a compulsory element in the education and training of future chemists. Existing training tends to focus on ethical dimensions of research conduct (e.g. animal welfare), rather than research impact.[67] Early detection of the misuse of chemistry requires chemists to sound the alarm. An ethical framework is likely to become increasingly important in a dynamic industry with many new chemicals being developed and manufactured.

The OPCW and the World Customs Organization have been working together to improve the capacity of states to enforce the CWC transfer regime in national customs training programmes.[68] An annual workshop on preventing illicit transfers of chemicals can be a platform for discussing the often-highlighted difficulty of resolving discrepancies in reporting chemical transfers.[69] Learning how to use new tools that are becoming available for reporting and analysing trade data could be the focus for annual CCT workshops.[70]

[64] OPCW, 'Capacity building', [n.d.].

[65] On the course and field exercise see OPCW, 'CHEMEX Africa 2023', [n.d.].

[66] On the Africa Programme see OPCW, 'Capacity building: Africa Programme', [n.d.].

[67] Köster, V. and Mehlich, J., 'Bringing ethics in chemistry to universities: An interview with Jan Mehlich', *ChemistryViews*, 4 Sep. 2018.

[68] OPCW, 'OPCW and World Customs Organization help address security challenges of international trade in chemicals', 27 May 2021.

[69] OPCW, 'Guidance for completing the Transfer Discrepancies Reply Form Version 2.0', July 2023.

[70] Marshall, W., McAllister, C. and Vestergaard, C., 'Reconciling discrepancies in the international trade of dual-use chemicals: The potential of blockchain technology', Issue brief, Stimson Center, 30 Mar. 2023.

V. Conclusions and recommendations

The Chemical Weapons Convention is not immune from the impact of geopolitical competition. In 2023 the fifth CWC Review Conference illustrated the difficulty of agreeing by consensus on common action under the umbrella of the Organisation for the Prohibition of Chemical Weapons. Nevertheless, the CWC continues to provide a framework for cooperation to the benefit of the vast majority of its states parties.

Through the work of the OPCW there is now a network of hundreds of individuals around the world dedicated to achieving full chemical weapon disarmament as envisaged in the CWC. Now that the destruction of declared stockpiles has been completed, it will be important to secure the continued engagement of this community and to build on it, particularly through a new generation of specialists.

The successful completion of the project to build a new Centre for Chemistry and Technology is evidence that the OPCW is able to deliver significant results despite the challenges presented by documented chemical weapon use. The CCT now needs to develop an ambitious programme of work in order to make its full contribution to chemical disarmament. Elements of a programme should include (*a*) understanding technological developments that have an impact on the CWC; (*b*) building skills in chemical forensics to support the law enforcement community in investigating and prosecuting crimes involving toxic chemicals; (*c*) broadening geographical representation in the international chemical disarmament effort; and (*d*) developing tailored training programmes that respond to the diverse needs of the CWC states parties.

Recommendations

Creating the tools that the OPCW will need to address a diverse set of challenges in conditions where financial resources will probably be limited will require cooperation under different frameworks aimed at common objectives. To adjust to its new role and to achieve the full potential of the CCT, the OPCW, the CSP and the states parties should adopt the following recommendations.

1. The OPCW should establish an Office of Science and Technology to support the director-general and should appoint a director of the Centre for Chemistry and Technology. The director should work with the OST to develop the centre's strategic direction.
2. In conditions of zero budget growth, the OPCW should address the staffing implications of the transition from verifying the destruction of declared stockpiles to a future-oriented agenda. This should include how to staff the new OST.
3. The CWC states parties should establish a trust fund for the CCT modelled on the SAB Trust Fund. This should provide the CCT with stable and secure financing that can be used in a flexible way to implement an agreed set of projects as part of a strategic programme.

SIPRI RESEARCH POLICY PAPER

THE CENTRE FOR CHEMISTRY AND TECHNOLOGY AND THE FUTURE OF THE OPCW

IAN ANTHONY

4. The Technical Secretariat should create a consultation mechanism where a strategic plan and programme of work for the CCT drafted by the new OST can be discussed with states parties and other relevant stakeholders on a regular basis. In this way, states parties can be confident that the work of the CCT is consistent with their expectations.
5. The OPCW should use its convening power to identify laboratories that have the necessary skills and resources to create a global network to promote chemical forensic science. The network should be convened at the CCT alongside a meeting of the Scientific Advisory Board to discuss how to make the work of the network sustainable and productive.
6. The OPCW should use its convening power to identify and bring together laboratories with the capacity to analyse biotoxins of relevance to the CWC.
7. The OPCW should join meetings of United Nations actors engaged in sustainable development and environmental protection that have a focus on reducing the risks from toxic chemicals.
8. The OPCW should incorporate a young scholars programme at the CCT as part of its Africa Programme.

sipri

STOCKHOLM INTERNATIONAL PEACE RESEARCH INSTITUTE
Signalistgatan 9
SE-169 72 Solna, Sweden
Telephone: +46 8 655 97 00
Email: sipri@sipri.org
Internet: www.sipri.org