III. Chemical arms control and disarmament

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The 1993 Chemical Weapons Convention (CWC) is the principal international legal basis for the prohibition of chemical warfare. No states joined the convention in 2016 and, as of December 2016, 192 states were party to the regime.[1]

The Organisation for the Prohibition of Chemical Weapons (OPCW) continued to experience financial difficulties in 2016. Since 2014 it has increasingly relied on the Working Capital Fund (WCF) to meet cash flow shortfalls.[2] The main reasons for the shortfalls in 2016 were: (*a*) non-payment of dues by a number of the states parties; (*b*) non-payment (or late payment) of direct costs of inspections incurred under Articles IV and V of the CWC; and (*c*) the cost of work carried out in connection to confirming the completeness and correctness of Syria's declarations.[3]

In 2016 the Advisory Board on Education and Outreach (ABEO) was established and met for the first time. Its initial work primarily related to the creation of common objectives and operational strategies. It also considered outreach strategies, including for youth outreach, website improvements and a proposed OPCW Visitor Centre.[4]

Counterterrorism activities

The OPCW's Open-ended Working Group on Terrorism, including its Sub-working Group on Non-state Actors (SWG), continued to hold meetings. The SWG, established in October 2015, met in 2016 and issued periodic reports.[5] Participants considered possible synergies with pre-existing counterterrorism activities within the United Nations framework, including

[1] Israel has signed (but has not ratified) the CWC, while Egypt, North Korea and South Sudan remained non-signatories. For a summary and other details of the Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on their Destruction (Chemical Weapons Convention, CWC) see annex A, section I, in this volume.

[2] OPCW, Conference of the States Parties, 21st session, 'Decision, programme and budget of the OPCW for 2017', C-21/DEC.6, 1 Dec. 2016, para. 6.

[3] As of July 2016, over 60 states parties were in arrears of their 2016 assessments. OPCW, Executive Council, 'Statement by Ambassador Kenneth D. Ward, United States delegation to the eighty-second session of the Executive Council, Organization for the Prohibition of Chemical Weapons', 12 July 2016, p. 4. By the time the Conference of the States Parties met in November–December 2016, 32 parties were in arrears of their payments. OPCW, C-21/DEC.6 (note 2), para. 9(n).

[4] OPCW, 'Advisory Board on Education and Outreach', <https://www.opcw.org/about-opcw/subsidiary-bodies/advisory-board-on-education-and-outreach/>.

[5] OPCW, Executive Council, 'Report by H.E. Ambassador Maria Teresa Infante, facilitator of the Sub-working Group on Non-State Actors of the Open-ended Working Group on Terrorism', EC-82/WP.1, 7 July 2016.

the work of the UN Counter-terrorism Committee Executive Directorate.[6] The SWG also discussed legal accountability and prevention and response measures with officials.[7] The SWG circulated a questionnaire on legal provisions relating to non-state actors to states parties in March 2016. The SWG also discussed the OPCW's contribution to counterterrorism activities, including with respect to legal accountability (i.e. full and effective implementation of relevant legal obligations), chemical security, assisting those threatened by chemical weapons (Article X of the CWC), and investigations of alleged chemical weapon use and—depending on the legal status of suspected violations—the associated activity and programmes.[8]

Science and technology developments

The OPCW engaged in consultations and issued reports on the implications of science and technology (S&T) developments for CWC verification. The OPCW also sought to strengthen networks to monitor S&T developments and to implement relevant outreach within, for example, scientific networks. Priorities included: (*a*) new approaches for chemical analysis (e.g. biosensors and molecular diagnostics) that are relevant for inspections and investigations of alleged use of chemical weapons; (*b*) new and emerging methods of chemical production that can inform site selection methodologies under Article VI of the CWC; and (*c*) economic, sociopolitical and regulatory factors that drive S&T and which are relevant for the full and effective implementation of Articles IV, V, VI, VII, IX and XI of the CWC.[9]

On 25 May 2016 the OPCW's Scientific Advisory Board (SAB) issued a paper on best practices for chemical weapon sample stability and storage. The paper provides a comprehensive scientific literature review and best practices for maintaining sample integrity in order to (*a*) obtain better quality analytical results (including through minimization of degradation between sampling and analysis); and (*b*) enable a better understanding of analytical results (including storage issues and biomedical samples).[10] The

[6] Relevant UN Security Council resolutions include 1373 (2001) and 1624 (2005) (to counter incitement to commit terrorist acts), and 2174 (2014) (to counter international terrorist fighters).

[7] OPCW, EC-82/WP.1 (note 5), para. 2.

[8] For detail of legal accountability in the context of the CWC see OPCW, Technical Secretariat, 'Note by the Technical Secretariat: the contribution of Article VI to states parties' efforts to counter terrorism', S/1387/2016, 19 May 2016. See also OPCW, 'Legislation kit', <https://www.opcw.org/our-work/national-implementation/implementing-legislation/legislation-kit/>. On chemical security and assistance and protection, see e.g. OPCW, Technical Secretariat, 'Note by the Technical Secretariat: the OPCW's role in the field of chemical security: discussion paper', S/1395/2016, 13 June 2016.

[9] OPCW, Executive Council, 'Note by the Director-General: the impact of the developments in science and technology in the context of the Chemical Weapons Convention', EC-82/DG.13, 7 June 2016, para. 21.

[10] OPCW, Scientific Advisory Board, 'Response to the Director-General's request to the Scientific Advisory Board to provide further advice on chemical weapons sample stability and storage',

SAB also issued advice on isotopically labelled chemicals and stereoisomers of scheduled chemicals. This paper advises on how to handle chemicals that have parent structures listed in the CWC's Annex on Chemicals but which are altered through isotopic labelling or by isolating a unique stereoisomer.[11] The OPCW's Technical Secretariat (TS) also organized workshops on chemical forensics (in June 2016) and chemical warfare agents, toxicity, emergency response, and medical countermeasures (in September 2016).[12] In addition, the OPCW finalized measures to establish a rapid response and assistance mission (RRAM) whose responsibilities include (*a*) detecting and characterizing toxic chemicals using on-site analytical equipment; (*b*) sample-taking (including biomedical) for off-site analysis; and (*c*) offering advice on how to secure an area for forensic examination and to isolate forensic evidence.[13]

Conference of the States Parties

The 21st session of the Conference of the States Parties (CSP) to the CWC met on 28 November–2 December 2016. The CSP agreed a 2017 programme and budget of €67 798 200 (*c*. $76.5 million), of which €29 129 200 (*c*. $33 million) is related to verification costs, €37 886 500 (*c*. $43 million) is related to administrative and other costs, and €782 500 (*c*. $883 000) is for the Enterprise Resource Planning project.[14] It also extended for 12 months a fund for special OPCW missions that, as of September 2016, totalled €110 181 (*c*. $125 000) and is mainly used to cover costs associated with the verification of Syria's declarations and holdings.[15] The CSP also recommended

SAB-23/WP.2, 25 May 2016. Such advice is important for several reasons. The CWC is based on chemical abstract service (CAS) numbers meaning it is possible to include or exclude chemicals from the CWC's routine declaration verification if the chemical's CAS number in base form only is listed in the OPCW Central Analytical Database.

[11] OPCW, Scientific Advisory Board, 'Response to the Director-General's request to the Scientific Advisory Board to provide further advice on scheduled chemicals', SAB-23/WP.1, 28 Apr. 2016, cited in OPCW, EC-82/DG.13 (note 9), para. 16. This issue is partly connected to the handling of declarations of transfers of tritiated saxitoxin for mouse bioassays in the period immediately following the CWC's entry into force.

[12] See e.g. OPCW, 'Scientists review the science of chemical forensics and potential applications in chemical weapons investigations', Press release, 24 June 2017. See also Bidwell, C. A. and Bhatt, K., *Use of Attribution and Forensic Science in Addressing Biological Weapon Threats: A Multi-Faceted Study* (Federation of American Scientists: Washington, DC, Feb. 2016).

[13] OPCW, Technical Secretariat, 'Note by the Technical Secretariat: establishment of a rapid response assistance team', S/1381/2016, 10 May 2016.

[14] The OPCW's programme and budget for 2017 is structured according to 7 'core objectives' (formerly 'pillars') together with an associated 'action plan' and performance indicators tied to a medium-term action matrix. OPCW, Conference of the States Parties, 21st session, 'Decision: programme and budget of the OPCW for 2017', C-21/DEC.6, 1 Dec. 2016, para. 9(c).

[15] OPCW, Conference of the States Parties, 21st session, 'Decision: extension of the special fund for OPCW special missions', OPCW document C-21/DEC.9, 1 Dec. 2016.

that the WCF be increased to €7 million (*c*. $7.9 million) by the end of 2019.[16] In addition, operating costs have been lowered by reducing the pay grades of some professional category TS positions prior to their being re-advertised as a result of vacancies caused by the OPCW's tenure policy, which limits most staff to seven years.

Side events were held on: (*a*) emerging technologies and the CWC (mobile data collection, big data and artificial intelligence); (*b*) cooperative efforts by the OPCW and states parties to remove chemicals from Libya for out-of-country destruction; (*c*) disarmament and its impact on industry (the 'Wiesbaden process'); (*d*) the future role of the Hague Ethical Guidelines and their relation to the OPCW; (*e*) central nervous system (CNS)-acting chemicals; (*f*) a demonstration of proposed changes to the OPCW Central Analytical Database (OCAD); (*g*) the status of destruction efforts of chemical weapons abandoned by Japan on the territory of China during World War II; (*h*) a demonstration of the OPCW's Secure Information Exchange (SIX) system; (*i*) a presentation of a report on needs assessment and compilation of tools, guidance and best practices on chemical safety and security management; (*j*) reports from the 2016 Spiez Convergence meeting and SAB workshops on chemical forensics and the mechanism of action of chemical weapon agents; (*k*) a demonstration of the Electronic Declarations Tool for National Authorities (EDNA); and (*l*) a review of the designation and certification processes of OPCW laboratories.

Preventing the misuse of non-traditional toxic chemicals

Since the CWC was negotiated the states parties have considered whether and how the convention's prohibitions could be undermined by the development, stockpiling and use of riot control agents (RCAs), incapacitants or CNS-acting chemicals if used for purposes other than domestic riot control (e.g. for counterterrorism or peacekeeping). They have also examined the implications of developing 'less than lethal' agents for novel purposes or as a means for maintaining possible offensive standby capacities. Such discussions have also taken into account the possible role of new or improved agent dissemination methods, including unmanned aerial vehicles.[17] A total of 37 states parties introduced a joint working paper at the 21st CSP, based on a 2014 working paper entitled 'Aerosolisation of central nervous system-acting chemicals for law enforcement purposes'.[18] In this working paper, sponsoring

[16] OPCW, C-21/DEC.6 (note 14), para. 9(r).

[17] Unusual applications periodically arise see e.g. Yuhas, A., 'Bike lock developed that makes thieves immediately vomit', *The Guardian*, 21 Oct. 2016.

[18] OPCW, Conference of the States Parties, 21st session, 'Aerosolisation of central nervous system-acting chemicals for law enforcement purposes', C-21/NAT.3/rev.3, 2 Dec. 2016. This paper was co-sponsored by Albania, Argentina, Australia, Austria, Belgium, Brazil, Bulgaria, Canada,

states parties proposed that the CWC membership undertake to declare how CNS-acting chemicals (or similar) will (or will not) be developed, stockpiled and used for law enforcement purposes. The SAB briefed the CSP on its S&T preparations for the Fourth Special Session to Review the Operation of the Chemical Weapons Convention (Fourth CWC Review Conference). The Fourth CWC Review Conference will further consider these issues.

Destruction of chemical weapons

Between 1997, when the CWC entered into force, and May 2016 8 states parties had declared chemical weapon stockpiles, while 4 states parties had declared abandoned chemical weapons (ACWs) on their territories and 16 states parties had declared the possession of old chemical weapons (OCWs).[19]

Libya

In 2004 Libya declared to the OPCW that it possessed just over 26 tonnes of category 1 chemical weapons, which it has since destroyed.[20] In early 2016 it informed the OPCW that it had completed the destruction of over 19 tonnes of pinacolyl alcohol (a category 2 chemical) at a facility in al-Osta Milad under remote verification monitoring.[21] As of May 2016 just over 689 tonnes (49 per cent) of around 1402 tonnes of declared category 2 chemicals had

Chile, Colombia, Croatia, Cyprus, Czech Republic, Estonia, Finland, Germany, Greece, Ireland, Japan, Latvia, Lithuania, Luxembourg, Malta, New Zealand, Norway, Poland, Portugal, Romania, Slovenia, South Korea, Spain, Switzerland, Turkey, the United Kingdom, Uruguay and the United States. Canada, Iran, Russia, Switzerland and the USA made statements on this issue.

[19] Chemical weapon stockpiles have been declared by Albania, India, Iraq, Libya, Russia, South Korea, Syria and the USA. Abandoned chemical weapons have been declared by China, Iran, Italy and Panama. However, the OPCW's Technical Secretariat determined that the munitions cited by Iran were conventional. The presence of unconfirmed or unidentified chemical munitions on the territory of Iran cannot be fully excluded (e.g. from the 1980–88 Iran–Iraq War).

[20] The CWC defines category 1 chemical weapons as 'Chemical weapons on the basis of Schedule 1 chemicals and their parts and components'. The CWC defines category 2 and category 3 chemical weapons as 'Chemical weapons on the basis of all other chemicals and their parts and components' and 'Unfilled munitions and devices, and equipment specifically designed for use directly in connection with [the] employment of chemical weapons', respectively. The order of destruction is informed by these categories and the entry into force of the CWC. Schedule 1 chemicals (category 1 chemical weapons) pose the highest threat to the object and the purpose of the CWC, while category 3 chemical weapons pose a lesser threat to the object and purpose of the CWC and are easier to destroy. For states that accede to the CWC today, the Executive Council must review and approve the destruction time frame on a case-by-case basis. It takes a number of issues into consideration, including the fact that the original order of destruction is not fully applicable for those states parties that are not original parties to the CWC. For detail of the chemical weapon categories see CWC, Verification Annex, Part IV(A), para. 16. For detail of the order of destruction see CWC, Verification Annex, Part IV(A), paras. 15–19. See also relevant previous volumes of the SIPRI Yearbook.

[21] OPCW, Executive Council, EC-81/NAT.1, 18 Feb. 2016 cited in OPCW, Executive Council, 'Report by the Director-General: overall progress with respect to the destruction of the remaining chemical weapons stockpiles', EC-82/DG.21, 11 July 2016, para. 5.

been destroyed.[22] Libya's remaining category 2 stockpile comprised thionyl chloride (293 tonnes), tributylamine (240 tonnes), phosphorus trichloride (162 tonnes) and 2-chloroethanol (19 tonnes).[23]

However, given the security situation and lack of destruction technology and other support, Libya's National Authority wrote to the Director-General of the OPCW in February 2016 requesting him to consider the option of transporting the remaining category 2 chemicals to a facility outside the country for destruction. The same month the OPCW's Executive Council asked the Director-General to coordinate efforts 'to identify and evaluate technical, operational, security, financial, and legal factors to address the destruction' of these chemicals. Meanwhile, the category 2 chemicals were transferred to new containers supplied by Canada, which were affixed with global positioning system (GPS) trackers to help to ensure security oversight and facilitate OPCW verification.

The TS and states parties undertook a series of consultations with the relevant actors. This was achieved primarily through the establishment of an operational planning group, with subgroups holding responsibility for logistics and communications, among other issues. On 20 July 2016 the Executive Council agreed to help destroy Libya's category 2 chemicals outside the country.[24] The TS began to develop a destruction plan and a list of recommendations for additional measures for the safe and expeditious transport, storage and disposal of these chemicals. On 27 July the Executive Council adopted a decision detailing the requirements for the destruction of Libya's remaining category 2 chemicals and establishing a special trust fund (STF) to support destruction outside the country.[25] The activities supported by the STF encompassed (*a*) operational planning and preparations pertaining to the storage, removal, destruction and verification of the remaining category 2 chemicals; (*b*) the drafting of agreements related to the storage, removal, destruction and verification of those chemicals as well as their actual storage, removal, destruction and verification; (*c*) transportation of samples for off-site analysis and characterization purposes; (*d*) decontamination of storage containers; and (*e*) any other support and verification activities, as deemed necessary.[26]

[22] Hoggins, L., 'Evolving verification: examples from nearly two decades of chemical demilitarisation', Presentation at 19th International Chemical Weapons Demilitarisation Conference CWD 2016, 25–27 May 2016, London, p. 12.

[23] Hoggins (note 22), p. 14.

[24] OPCW, Executive Council, 'Decision: destruction of Libya's remaining chemical weapons', EC-M-52/DEC.1, 20 Jul. 2016.

[25] OPCW, Executive Council, 'Decision: detailed requirements for the destruction of Libya's remaining category 2 chemical weapons', EC-M-52/DEC.2, para. 7.

[26] OPCW, Technical Secretariat, 'Note by the Technical Secretariat: request from the Director-General to states parties for voluntary contributions to a new trust fund for support to Libya', S/1400/2016, 1 Aug. 2016, para. 9.

The OPCW determined that Germany was best placed for handling all four category 2 chemicals using existing technologies and equipment. Based on the experience of the 2013–14 Syrian maritime removal operation, the OPCW also decided that Denmark was in the best position to use its assets to effect the Libyan maritime removal operation. On 26 August 2016 the Executive Council considered and adopted a decision on the plan for the destruction of Libya's category 2 chemicals outside its territory and an arrangement between the OPCW and Germany for the destruction of these chemicals.[27]

States providing assistance included Canada, Denmark, Finland, France, Germany, Italy, Malta, Spain, the United Kingdom and the United States. According to one unofficial estimate, the total cost of the Libyan removal operation was approximately $7 million, while the Syrian maritime removal operation cost around $20 million.[28]

On 27 August Denmark led 'operation removal of chemical agents from Libya' (OPRECLIB). A total of 23 containers, holding approximately 500 tonnes of chemicals, were loaded. The containers were checked for leaks approximately once every four hours while en route. On 8 September the containers were transferred to Germany.[29] The Gesellschaft zur Entsorgung von Chemischen Kamptstoffen und Rüstungsaltlasten MBH (GEKA MBH) will destroy the category 2 chemicals in four phases: (*a*) phase 1—destruction of 2-chloroethanol; (*b*) phase 2—destruction of tributylamine; (*c*) phase 3—destruction of phosphorus trichloride; and (*d*) phase 4—destruction of thionyl chloride.[30] Destruction is to be completed within 15 months of the arrival of the chemicals at GEKA MBH.[31]

In November 2016 Libya confirmed a plan to implement an environmental clean-up at a former chemical storage facility at Ruwagha. The proposed 2017 start date for the clean-up operation was contingent on receipt of European Union (EU) support.[32] Environmental challenges include the possible existence of incineration and hydrolysis products of pre-2016 sulphur mustard

[27] OPCW, Executive Council, 'Decision: plan for the destruction of Libya's remaining category 2 chemical weapons outside the territory of Libya', EC-M-53/DEC.1, 26 Aug. 2016. For further detail of the 2013–14 Syrian maritime removal operation see relevant previous volumes of the SIPRI Yearbook.

[28] Hart, J., 'Moving day', *CBRNe World* (Dec. 2016), pp. 51–53.

[29] Unclassified briefing by official, 2016.

[30] OPCW, Executive Council, 'Decision: arrangement between the Organisation for the Prohibition of Chemical Weapons and the Government of Germany governing on-site inspections at the Gesellschaft zur Entsorgung von Chemischen Kampfstoffen und Rüstungsaltlasten MBH (GEKA MBH) Munster, and at the port of disembarkation in Germany', EC-M-53/DEC.2, 2 Aug. 2016, para. 16.

[31] OPCW, Executive Council, 'Note by the Director-General: plan for the destruction of Libya's remaining category 2 chemical weapons outside the territory of Libya', EC-M-53/DG.1, 19 Aug. 2016, para. 2.

[32] See the statements by Libya's permanent representative to the OPCW and an EU official at the Fifth EU Non-proliferation and Disarmament Conference, 'Progress and challenges in chemical disarmament', Brussels, 4 Nov. 2016.

destruction operations, which may comprise several tonnes of contaminated salts. In addition, a number of the older tanks filled with phosphorus trichloride and thionyl chloride were badly corroded and probably leaked.

Russia

As of 28 November 2016 Russia had destroyed 38 460 tonnes of chemical agents or 96.2 per cent of its stockpile.[33] Russia is scheduled to complete the destruction of chemical weapons at its sole remaining stockpile facility in Kizner by 31 December 2020.[34] The facility originally held a combined total of 5745 tonnes of sarin, soman and V-series nerve agents filled into approximately 2 million artillery shells and rockets.[35]

United States

As of 31 October 2016 the USA had destroyed 24 952 tonnes of chemical agents or just under 90 per cent of its stockpile.[36] The USA is scheduled to complete the destruction of its stockpile, located at two sites—the Blue Grass facility in Kentucky and the Pueblo facility in Colorado—by September 2023.[37] The stockpile at the Blue Grass and Pueblo facilities comprises (*a*) M55/M56 rockets filled with sarin or VX nerve agent; (*b*) 8-inch (203-millimetre) projectiles filled with sarin; (*c*) 155-mm projectiles filled with VX or sulphur mustard; and (*d*) 105-mm projectiles, 4.2-inch (107-mm) mortars and bottles filled with sulphur mustard.[38]

The USA is scheduled to start chemical weapon destruction operations at the Blue Grass facility in April 2020.[39] The US National Academies of Sciences issued a report in 2016 on Blue Grass operations that (*a*) assesses the impact of design changes to the facility; (*b*) reviews and assesses calculations associated with metal parts treatment and thermal oxidation;

[33] OPCW, Conference of the States Parties, 21st session, 'Russian Federation: statement by Mr Kalamanov, Head of the Delegation of the Russian Federation and Deputy Minister of Industry and Trade of the Russian Federation at the Twenty-First Session of the Conference of States Parties', 28 Nov. 2016, p. 1.

[34] OPCW, EC-82/DG.21, (note 21), para. 19.

[35] Hart, J., 'Assistance for the destruction of chemical weapons in the Russian Federation: political and technical aspects', Background Paper no. 5, Conference on Strengthening European Action on WMD Non-proliferation and Disarmament: How Can Community Instruments Contribute?, Brussels, 7–8 Dec. 2005, p. 20.

[36] OPCW, Conference of the States Parties, 21st session, 'United States of America: statement by Deputy Assistant Secretary Mallory Stewart to the Twenty-First Session of the Conference of the States Parties', 29 Nov. 2016, p. 2.

[37] OPCW, EC-82/DG.21, (note 21), para. 23.

[38] Whyne, C. F., '2016—mission readiness: an ACWA progress report', Presentation at 19th International Chemical Weapons Demilitarisation Conference CWD 2016, 25–27 May 2016, London, pp. 7, 10.

[39] OPCW, EC-82/DG.21, (note 21), para. 28.

(*c*) reviews and assesses the contractor's approach to destruction efficiency; and (*d*) assesses the validity of process modelling.[40]

The baseline destruction technology at the Pueblo facility is neutralization followed by supercritical oxidation in combination with the use of static detonation chambers.

Old or abandoned chemical weapons

Belgium destroys its OCWs at Poelkapelle. In 2007 Belgium commenced the destruction of its OCWs using the DAVINCH™ explosive containment destruction system. Dynasafe provided a further incineration-based destruction technology starting in 2014, which became fully operational in late 2016. As of 11 May 2016 the number of OCWs and conventional munitions destroyed totalled 10 409. These munitions consisted of 3931 7.7–21-centimetre Clark shells (DC/DA) and 6478 high-explosive (HE) shells containing arsenical smokes (and similar).[41]

France has yet to begin destroying its OCWs.[42] It has consolidated its OCWs at the Site d'élimination des chargements d'objets identifiés anciens (SECOIA) in Mailly-le-Camp. The facility has the capacity to destroy 42 tonnes per year (which amounts to around 3000 munitions). France has decided to use the DAVINCH™ system as its baseline destruction technology. Groupe Séché, a specialist waste recovery and treatment provider, will provide chemical analysis support.[43]

In 2016 *Japan* continued to carry out final magnetometer checks in Kanda Port for World War II-era dumped chemical munitions.[44] In 2004–13 Japan recovered and destroyed 2968 chemical munitions (mainly 50-kilogram yellow munitions and 15-kg red munitions) from Kanda Port and its connecting channels (an area of 23 square kilometres).[45]

[40] National Academies of Sciences, Engineering and Medicine, Committee on Effects of the Deletion of Chemical Agent Washout on Operations at the Blue Grass Chemical Agent Destruction Pilot Plant, Board on Army Science and Technology, Division on Engineering and Physical Sciences, *Effects of the Deletion of Chemical Agent Washout on Operations at the Blue Grass Chemical Agent Destruction Pilot Plant* (National Academies Press: Washington, DC, 2016).

[41] Kuriyama, A. and Shimoda, O., 'DAVINCH operations updates 2016', Presentation at 19th International Chemical Weapons Demilitarisation Conference CWD 2016, 25–27 May 2016, London, p. 21.

[42] For further detail see relevant previous volumes of the SIPRI Yearbook.

[43] French Ministry of Defence, General Armaments Directorate, 'SECOIA: Site d'élimination des chargements d'objets identifiés anciens', 24 Mar. 2016. See also Séché Environnement, <http://www.groupe-seche-international.com/>.

[44] Kitamura, R., 'Recovery and destruction of sea-dumped chemical weapons, a relook into Kanda operations', Presentation at 19th International Chemical Weapons Demilitarisation Conference CWD 2016, 25–27 May 2016, London, p. 20. For further detail see relevant previous volumes of the SIPRI Yearbook.

[45] The yellow munitions typically contain 18 litres of Lewisite-sulphur mustard mixture and 2.3 kg of high explosives. The red munitions typically contain 368 g of diphenylchloroarsine/diphenylcyanoarsine (DA/DC) mixture and 1.3 kg of high explosives. Kitamura (note 44), p. 17.

China and *Japan* continued to jointly determine the nature and scope of Japanese ACWs left in China during World War II. These ACWs have caused more than 2000 casualties since the People's Republic of China was founded in 1949.[46] This joint work is based on two memoranda of understanding concluded by the countries in 1999 and 2012 respectively.[47] ACWs have been found at more than 90 sites in 18 provinces.[48]

The ACWs in China include chemical projectiles (75-mm, 105-mm, 150-mm), mortars (90-mm), air bombs (15-kg, 50-kg), canisters (i.e. small, medium and large gas pots) and miscellaneous components (i.e. burster tubes, booster tubes and containers or drums filled with sulphur mustard).[49] Canisters comprise approximately 70.4 per cent of the total recovered ACW items. Shells comprise approximately 21 per cent. Miscellaneous components account for the remaining 8.6 per cent.[50]

Japan continued to carry out destruction operations in China in 2016 at multiple sites, mainly in central eastern and north-eastern regions.[51] A total of 53 076 ACWs have been recovered while at least another 330 000 ACWs are yet to be recovered.[52] The recovered ACWs are stored in 10 warehouses and 15 temporary warehouses. The unrecovered 330 000 ACWs are almost entirely located at a site in Haerbaling about 1300 km north-east of Beijing.[53] Of the 53 076 recovered ACWs, 39 695 had been destroyed as of 20 May 2016.[54]

The baseline destruction technology comprises detonation chamber and static kiln detonation systems (see table 13.1). Technical challenges include (*a*) the underwater recovery of munitions (Jiamusi, Heilongjiang Province); (*b*) the irreversible destruction of pre-treated agent mixtures (74 tonnes at Liaoyuan, Jilin Province); (*c*) disposal of fused munitions recovered at Taiyuan (Shanxi Province); (*d*) the final deposition of contaminated soil; and

[46] Tang, C., 'Destruction of Japanese abandoned chemical weapons discovered in China: progress and challenges', Presentation at 19th International Chemical Weapons Demilitarisation Conference CWD 2016, 25–27 May 2016, London, p. 4.

[47] Tang (note 46), p. 6.

[48] Tang (note 46), p. 7.

[49] Tang (note 46), p. 8; and Satake, M., 'Abandoned chemical weapons destruction projects in China', Presentation at 19th International Chemical Weapons Demilitarisation Conference CWD 2016, 25–27 May 2016, London, p. 1.

[50] Satake (note 49), p. 1.

[51] For further detail see relevant previous volumes of the SIPRI Yearbook.

[52] Satake (note 49), p. 1.

[53] The warehouses are at Guangzhou, Haerbaling, Harbin, Jiamusi, Nanjing, Ningan, Qiqihar, Shenyang, Shijiazhuang and Yichun. Their contents comprise 11 451 ACW items and over 201 tonnes of contaminated material. The temporary warehouses are at Anqing, Bayannaoer, Bei'an, Dalian, Hangzhou, Hulunbeier, Hunchun, Jixi, Liaoyuan, Longjin, Nanning, Nianzishan, Shangzhi, Taiyuan and Tonghua. Their contents comprise 2505 ACW items, 74 tonnes of partially disposed chemical warfare agents and over 450 kg of contaminated material. Tang (note 46), pp. 10, 18.

[54] Satake (note 49), p. 23.

Table 13.1. Location and volume of chemical munitions cumulatively destroyed by the DAVINCH™ static detonation chamber and offgas system in China

	Nanjing[a]	Wuhan[a]	Shijiazhuang[b]	Haerbaling[b]
Projectiles				
Yellow (L/HD)	14	22	384	96
Red (DA/DC)	58	145	463	339
Blue-White (CG/trichlorarsine)	. .	1	21	. .
Other	. .	14	17	. .
Air bombs				
15-kg red bomb	. .	. .	1	. .
50-kg yellow bomb	. .	. .	4	. .
Canisters (gas pots)	35 601	79	1 285	. .
Containers/drums				
L/HD	7	. .	. .	. .
Other	1	3	126	10

. . = data not available; CG = phosgene; DA = diphenylchloroarsine; DC = diphenylcyanoarsine; HD = sulphur mustard; kg = kilogram; L= Lewisite.

[a] Completed.
[b] As of 1 May 2016.

Source: Kuriyama, A. and Shimoda, O., 'DAVINCH operations updates 2016', Presentation at 19th International Chemical Weapons Demilitarisation Conference (CWD) 2016, 25–27 May 2016, London, <http://cwd2016.weebly.com/presentations.html>, p. 19.

(*e*) the lack of capacity to destroy incidentally discovered munitions using a mobile destruction system.[55]

For the financial year 2016 Japan allocated approximately €2.54 million (*c*. $2.9 million) for ACW destruction operations in China.[56] The Haerbaling project uses a fixed destruction facility, while mobile destruction facilities are employed for sites in Nanjing, Wuhan, Shijiazhuang and Harbin.

A proposal for a new convention on the suppression of acts of terrorism

In 2016 Russia proposed to negotiate a new convention against acts of chemical and biological terrorism. The proposal was made partly in the context of attempting to reactivate the Conference on Disarmament (CD).[57] There are differing views as to whether the CD should negotiate a new treaty or whether such a treaty should be referred to the UN in New York because this is where existing counterterrorism mechanisms and activities are centred.

[55] Tang (note 46), p. 30.
[56] Satake (note 49), p. 7.
[57] The CD has been unable to agree on starting any further arms control negotiations since it concluded the CWC negotiations in 1992. The CD concluded negotiations on the Comprehensive Nuclear-Test-Ban Treaty (CTBT) in 1996. Governments annually discuss and exchange views on possible future negotiating mandates of the CD.

Russia added further specifics on concluding a new convention for the suppression of acts of chemical terrorism as the year progressed.[58] On 24 May the CD discussed the Russian proposals.[59] The positions of the states can be categorized into three broad groupings.

1. A gap exists within existing chemical and biological weapon control and verification mechanisms (e.g. the weakness of the 1972 Biological and Toxin Weapons Convention and the fact that biological or biochemical weapons are excluded from the mandate of the OPCW).[60]

2. Existing international chemical and biological weapon control and verification mechanisms are sufficient and any difficulties emanating from non-state actor threats reflect a lack of domestic implementation of existing treaty obligations.

3. Maintaining a neutral or ambiguous stance.

Russia observed that there have been examples where existing legal channels and instruments either have not been used at all or have not been used in a manner that permitted resolution of the issue of concern. Russia also noted that bioterrorism cannot be discussed substantively at the OPCW.[61] Syria stated that chemical weapon threats were imminent and that there were reports that the Islamic State is expanding its geographical scope of operations outside Iraq and Syria. Syria also stated that the CD was the appropriate venue to open negotiations based on the Russian proposal.[62] By contrast, the USA stated that existing instruments are sufficient, while Germany stated that it was inclined to rely on existing measures for the time being.[63] Norway stated that it was unable to support the main views of the Russian paper and that the CD would not in any case be a productive venue for such negotiations.[64] Switzerland suggested that the Russian proposals could be further developed to make them more broadly acceptable.[65]

In July 2016 the European External Action Service (EEAS) stated: 'Regarding the Russian initiative for a stand-alone "international convention for

[58] Russian Ministry of Foreign Affairs, 'Elements of the Draft International Convention for the Suppression of Acts of Chemical Terrorism', Unofficial translation, 6 Apr. 2016.

[59] United Nations Office at Geneva, 'Conference on Disarmament discusses Russian proposals on a Convention on Chemical and Biological Terrorism and on a programme of work', Press release, 24 May 2016.

[60] While the CWC covers toxins, its verification regime for certain discrete organic chemicals that may contain the elements phosphorus, sulphur or fluorine (DOC/PSFs) does not capture toxins. Also, central nervous system (CNS)-acting chemicals are typically non-biological in nature (excluding toxins). In principle, the OPCW can cover other biological or biochemical agents in its routine or non-routine declaration and verification regimes. This can be done, for example, if the parties agree that biological or biologically mediated processes are covered by the term 'production by synthesis' and by taking decisions that explicitly cover chemicals that can be aerosolized and affect the CNS.

[61] United Nations Office at Geneva (note 59).

[62] United Nations Office at Geneva (note 59).

[63] United Nations Office at Geneva (note 59).

[64] United Nations Office at Geneva (note 59).

[65] United Nations Office at Geneva (note 59).

the suppression of acts of chemical terrorism", there are not perceived legal gaps in the relevant international legal framework. In fact, efforts should turn towards the full implementation of the existing international norms."[66] Russia later tabled its proposed draft convention at a meeting of the CD in August.[67]

Similar proposals have been made previously and, in principle, certain existing conventions could be applicable in the case of an act of terrorism using chemical or biological weapons. The Harvard Sussex Program on Chemical and Biological Weapons, for example, proposed a draft convention against the use of chemical and biological weapons starting in 1996–98.[68] In addition, the International Convention for the Suppression of Terrorist Bombings was adopted by the UN General Assembly on 15 December 1997 and refers to 'A weapon or device that is designed, or has the capability, to cause death, serious bodily injury or substantial material damage through the release, dissemination or impact of toxic chemicals, biological agents or toxins or similar substances or radiation or radioactive material'.[69] States may also take action against the terrorist use of chemical or biological weapons under international humanitarian law as it relates to non-international armed conflicts, in which case the Rome Statute of the International Criminal Court is applicable in principle.[70] This would be a difficult course of action to pursue, however, given that states generally avoid expansive readings of international legal regimes, particularly those that carry the possibility for prosecution and imprisonment of individuals.[71]

[66] Iliopoulos, D., European External Action Service, 'EU support for preventing proliferation and use of biological, chemical, radiological and nuclear weapons, including by non-state actors', Presentation at the Fifth Consultative Meeting of the EU Non-Proliferation Consortium, Brussels, 7–8 July 2016, para. 5(c).

[67] Conference on Disarmament, 'Letter dated 3 August 2016 from the Permanent Representative of the Russian Federation addressed to the Secretary-General of the Conference on Disarmament transmitting the texts of elements of the draft international convention for the suppression of acts of chemical and biological terrorism and the attached addendum', CD/2071, 18 Aug. 2016.

[68] Meselson, M. and Robinson, J., *A Draft Convention to Prohibit Biological and Chemical Weapons Under International Criminal Law* (Harvard Sussex Program: May 2002); and Meselson, M., *Bioterror: What Can be Done?* (Harvard Sussex Program: May 2002). See also Harvard Sussex Program, 'The HSP draft convention', <http://www.sussex.ac.uk/Units/spru/hsp/Harvard-Sussex-Program-draft-convention-Text.html>.

[69] International Convention for the Suppression of Terrorist Bombings, opened for signature 12 Jan. 1998, entered into force 23 May 2001, <https://treaties.un.org/doc/db/terrorism/english-18-9.pdf>, Article 1(3)(b).

[70] Rome Statute of the International Criminal Court, opened for signature 17 July 1998, entered into force 1 July 2002, <https://www.icc-cpi.int/nr/rdonlyres/ea9aeff7-5752-4f84-be94-0a655eb30e16/0/rome_statute_english.pdf>.

[71] Meier, O. and Trapp, R., 'Russia's chemical terrorism proposal: red herring or useful tool?', *Bulletin of the Atomic Scientists* (7 June 2016); and Dukic, S., 'Russia's chemical proposal', *Trust & Verify*, no. 153 (summer 2016), pp. 18–19.