

13. Chemical and biological weapon developments and arms control

JOHN HART and FRIDA KUHLAU

I. Introduction

The Sixth Review Conference of the States Parties to the 1972 Biological and Toxin Weapons Convention (BTWC), held on 20 November–8 December 2006, agreed to continue convening annual meetings in the period 2007–10.¹ A three-person convention implementation support unit (ISU) will be set up to receive and distribute information among the parties, partly to assist these inter-sessional meetings.

The 11th Conference of the States Parties (CSP) to the 1993 Chemical Weapons Convention (CWC), the principal international legal instrument against chemical weapons, met in December 2006.² It took mainly procedural decisions on implementation matters, but it also decided that representatives of the Executive Council of the Organisation for the Prohibition of Chemical Weapons (OPCW) should visit the CW facilities of parties that have requested extension of the CW destruction deadlines. The CWC mandates that all CW stockpiles must be destroyed no later than 29 April 2012, and these visits reflect the increased concern among the parties that the deadline will not be met by all of the states that possess chemical weapons.

Efforts continued in 2006 to achieve universal membership of the BTWC and the CWC and on ensuring that the states parties implement their convention obligations through effective national measures. Developments related to bio-security and bio-safety received attention in various frameworks and initiatives, including ad hoc arrangements and activities at the national and regional levels. Some of these efforts concentrate on improving disease surveillance and response, while others are devoted to international non-proliferation and disarmament assistance measures. Such decentralized and overlapping initiatives are partly a consequence of the BTWC's weak verifica-

¹ On the Sixth Review Conference see the United Nations 'Weapons of mass destruction' website, URL <<http://disarmament2.un.org/wmd/bwc/>>. The Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction was signed on 10 Apr. 1972 and entered into force on 26 Mar. 1975. The text is reproduced on the SIPRI Chemical and Biological Warfare Programme website at URL <<http://www.sipri.org/contents/cbwarfare/>>. The site includes complete lists of parties, signatories and non-signatories to this convention. See also annex A in this volume.

² The Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on their Destruction was signed on 13 Jan. 1993 and entered into force on 29 Apr. 1997. The text is available on the SIPRI Chemical and Biological Warfare Programme website (note 1), which includes complete lists of parties, signatories and non-signatories to this convention. See also annex A in this volume.

tion provisions. In 2006 allegations of the development or use of chemical and biological weapons (CBWs) continued to be made and more information became available about past CBW programmes.

Section II of this chapter discusses the outcome of the Sixth Review Conference of the BTWC. Developments related to the CWC are described in section III, and section IV examines allegations of CBW use and past CBW programmes. Developments in Iraq and the verification lessons learned in 2006 by the United Nations Monitoring, Verification and Inspection Commission (UNMOVIC) are discussed in section V. The prevention of bio-terrorism and remediation measures, including developments related to biological and chemical security, are addressed in section VI. Section VII presents the conclusions.

II. Biological weapon disarmament

The major biological weapon (BW) disarmament and arms control event in 2006 was the Sixth Review Conference of the States Parties to the Biological and Toxin Weapons Convention. As of December 2006, 155 states had ratified or acceded to the convention.³ On 26–28 April a preparatory committee met in Geneva, adopted the provisional agenda and draft rules of procedure for the review conference, and requested the conference secretariat to prepare background reports.⁴ Legal and political analysts also published briefing material and analyses to assist in preparation for the review conference.⁵

In the period preceding the review conference the Council of the European Union (EU) adopted a Joint Action that authorizes spending up to €867 000 (\$1.1 million) and has a planned duration of 18 months. It will support the BTWC by promoting universal membership and national implementation of its provisions.⁶ A key motivation among the parties for achieving universal

³ The states that had signed but not ratified the BTWC were Burundi, Central African Republic, Egypt, Guyana, Haiti, Ivory Coast, Gabon, Liberia, Madagascar, Malawi, Myanmar (Burma), Nepal, Somalia, Syria, Tanzania and the United Arab Emirates. The states that had neither signed nor ratified the convention were Andorra, Angola, Cameroon, Chad, Comoros, Cook Islands, Djibouti, Eritrea, Guinea, Israel, Kazakhstan, Kiribati, Marshall Islands, Mauritania, Micronesia, Montenegro, Mozambique, Namibia, Nauru, Niue, Samoa, Trinidad and Tobago, Tuvalu and Zambia.

⁴ Preparatory Committee for the Sixth Review Conference of the States Parties to the Convention on the Prohibition of Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction, 'Report of the Preparatory Committee', document BWC/CONF.VI/PC/2, 3 May 2006, para. 22, pp. 4–5. For background papers and review conference documents cited in this chapter see the UN Office at Geneva 'Disarmament' website, URL <<http://www.unog.ch/>>.

⁵ E.g. British American Security Information Council (BASIC), the Harvard Sussex Program and the Verification Research, Training and Information Centre (VERTIC), *Briefing Book: BWC Sixth Review Conference 2006* (nbmedia: Geneva, Oct. 2006); and Zanders, J. P. and Nixdorff, K., *Enforcing Non-Proliferation: The European Union and the 2006 BTWC Review Conference*, Chaillot Paper no. 93 (European Union Institute for Security Studies: Paris, Nov. 2006).

⁶ The Joint Action identifies 3 main types of provision that should be incorporated into the national implementation of the convention: (a) adoption of national legislation, including penal legislation, which encompasses the full scope of BTWC prohibitions; (b) effective regulations or legislation to control and monitor transfers of relevant dual-use technologies; and (c) effective implementation and enforcement to prevent violations and sanction breaches. 'Council Joint Action 2006/184/CFSP of 27 February 2006 in support of the Biological and Toxin Weapons Convention, in the framework of the EU Strategy against

membership of the BTWC and comprehensive implementation of its provisions is the recognition that such measures will raise barriers against possible bio-terrorism. Under the Joint Action regional workshops will be convened to explain the benefits of joining the convention to non-parties and to offer them EU technical assistance to join and implement it. A survey of national legislation and the extent to which the convention is effectively implemented will also be carried out. The Council of the European Union also adopted a Common Position stating that the BTWC is ‘the cornerstone of efforts to prevent biological agents and toxins from ever being developed and used as weapons’.⁷

The Sixth Review Conference was focused and constructive. Masood Khan of Pakistan, the president of the conference, emphasized the importance of producing a ‘concise and accessible’ final document and that the parties should reaffirm the norms and core elements of the BTWC. Khan urged that synergies be sought between proposals and mechanisms—rather than viewing them as ‘trade-offs’—and the avoidance of a ‘lowest common denominator’ outcome.⁸ The UN Secretary-General, Kofi Annan, stated that the BTWC must be viewed as ‘part of an interlinked array of tools . . . to deal with an interlinked array of problems’, including public health requirements, terrorism and criminal activity by non-state actors.⁹ General debate and the tabling of national papers were followed by an article-by-article review of the convention by the Committee of the Whole. Plenary sessions met periodically during the conference to consider cross-cutting issues and ‘clusters’ of delegations negotiated text for inclusion in the review conference’s final statement.¹⁰

The parties discussed: (a) scientific and technological developments, (b) national implementation of the convention, (c) confidence-building measures (CBMs), (d) implementation support, (e) the modalities for possible meetings between the Sixth and Seventh Review Conferences, (f) bio-safety and bio-security, (g) scientific and technological cooperation, (h) compliance and verification, (i) coordination with other organizations, and (j) bio-terrorism. The ISU, which will be attached to the UN Department for Disarmament Affairs, among other things will help coordinate efforts by the BTWC parties to develop measures to promote effective implementation of the convention,

the Proliferation of Weapons of Mass Destruction’, *Official Journal of the European Union*, L65 (7 Mar. 2006), pp. 51–55.

⁷ ‘Council Common Position 2006/242/CFSP of 20 March 2006 relating to the 2006 Review Conference of the Biological and Toxin Weapons Convention (BTWC)’, *Official Journal of the European Union*, L88 (25 Mar. 2006), p. 65, para. 1.

⁸ Sixth BTWC Review Conference, ‘Opening statement by the President of the Sixth Review Conference of the Biological Weapons Convention, Ambassador Masood Khan (Pakistan)’, Geneva, 20 Nov. 2006.

⁹ Sixth BTWC Review Conference, ‘The Secretary-General: remarks to the Sixth Review Conference of the Biological Weapons Convention’, Geneva, 20 Nov. 2006.

¹⁰ The BioWeapons Prevention Project (BWPP) produced daily briefing papers on the work of the conference. See the BWPP website at URL <<http://www.bwpp.org>>. Non-governmental organizations were also able to make presentations on a range of activities related to the BTWC during lunch breaks. See Center for Arms Control and Non-Proliferation, ‘BWC observer’, URL <<http://www.bwc06.org/>>; and the Biological and Toxin Weapons Convention website at URL <<http://www.opbw.org>>.

improve bio-safety and bio-security at biological facilities and enhance national capabilities for disease surveillance, detection and diagnosis.¹¹ The final document of the conference included an article-by-article review of the parties' understanding of the BTWC provisions and noted the results of the 2003–2005 inter-sessional process: meetings of experts and states parties that were conducted in accordance with a decision of the 2002 reconvened Fifth Review Conference of the States Parties to the BTWC.¹²

Verifying compliance with the convention was also considered: both with regard to specific cases of concern, and in terms of general procedures and mechanisms to ensure, for example, that the BTWC effectively covers scientific and technological developments.¹³ The United States identified several mechanisms for addressing compliance concerns. It is developing guidelines and procedures that can be used in response to any disease outbreak to determine whether it is caused deliberately and, if so, the most suitable scientific and technological means to identify those responsible.¹⁴

During the review conference new groupings of mainly Western states and one of Latin American states emerged.¹⁵ These groups took positions that differed from those of the Western Group¹⁶ and the Group of the Non-Aligned Movement (NAM) and Other States, respectively.¹⁷ Some developing states did not express or de-emphasized the past criticism that national export controls may conflict with Article X of the BTWC, which calls for the convention to be implemented in a manner that avoids hampering economic and technological development and preventing the exchange of information, material and equipment for peaceful purposes.¹⁸ In addition, some members of the East European Group are now EU members and increasingly associate themselves with the work of the Western Group.

The conference considered action plans on universality, national implementation, Article X and comprehensive implementation of the BTWC. The proposed action plan on national implementation urged the parties to designate a national implementing body for the convention, enact legislation, review their national export control laws and submit periodic updates to the other parties.

¹¹ See UN Office at Geneva (note 4).

¹² On past BTWC review conferences see CBW chapters in previous editions of the SIPRI Yearbook.

¹³ On suspected BW programmes see section IV.

¹⁴ Sixth BTWC Review Conference, 'Confronting noncompliance with the Biological Weapons Convention', document BWC/CONF.VI/WP.27*(revised), 24 Nov. 2006.

¹⁵ The mainly Western group was referred to as JACKSNNZ (Japan, Australia, Canada, Korea (South), Switzerland, Norway and New Zealand) or Jacksons 7. They were among the most active Western Group participants at the conference. The group of Latin American states were Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Mexico, Peru and Uruguay. This group prepared a number of joint working papers.

¹⁶ The Western Group comprises mainly West European states as well as Australia, Canada, New Zealand and the USA.

¹⁷ E.g. the positions differed in terms of the level of attention devoted to verification and compliance issues.

¹⁸ Some developing states maintain that the implementation of export control regimes by mainly developed states impedes the full implementation of Article X. They also argue that the convention should be implemented so that it does not impede economic cooperation and development.

Agreement could not be reached on such an action plan, in part because of a late proposal by the NAM to adopt an action plan on the implementation of Article X.¹⁹ Linking national implementation to Article X implementation was unacceptable to a number of parties, including the USA.

In 1986 the Second Review Conference of the States Parties to the BTWC agreed in its Final Declaration that the parties should submit annual data exchanges on activities of possible BW relevance to serve as a CBM.²⁰ However, some parties have failed to comply with this politically binding decision to provide information and, among those that have, some have done so irregularly. The quality and completeness of the information submitted have also periodically been questioned. In some cases this can be a positive development provided that other parties successfully seek informal clarification. Given their sensitive nature, such consultations are presumably carried out either bilaterally or among a limited number of parties. The nature and scope of such consultations that have occurred have not generally been published in detail and thus they tend to be poorly understood.²¹ The extent to which CBMs adequately cover current bio-defence programmes and those that counter bio-terrorism (as opposed to traditional biological defence programmes) is also not clear and a matter of concern to many analysts because such programmes could serve as a cover for prohibited activities. Proposals have therefore been put forward to make the annual data exchanges legally binding, and to revise and expand the CBM formats,²² although there is continued concern that sensitive national security and proprietary business information not be divulged. The shortcomings of the CBMs can be seen as reason to further develop them in the BTWC framework and as grounds for looking to other mechanisms to strengthen the international prohibition against BW. Such mechanisms could include national implementation of UN Security Council Resolution 1373—which deals with threats to international peace and security caused by terrorist acts—and the work of the 1540 Committee, a non-permanent body that assists with the implementation of UN Security Council Resolution 1540.²³

¹⁹ Pearson, G., 'The Biological Weapons Convention Sixth Review Conference', *CBW Conventions Bulletin*, no. 74 (Dec. 2006), p. 35.

²⁰ In 1991 the Third Review Conference agreed that information would be provided in other areas, including past offensive and defensive biological research and development programmes.

²¹ For an account of consultations carried out in order to clarify the status of Soviet compliance with the BTWC see Kelly, D. C., 'The Trilateral Agreement: lessons for biological weapons verification', eds T. Findlay and O. Meier, Verification Research, Training and Information Centre (VERTIC), *Verification Yearbook 2002* (VERTIC: London, 2002), pp. 93–109.

²² E.g. Hunger, I. and Isla, N., 'Confidence-building needs transparency: an analysis of the BTWC's confidence-building measures', *Disarmament Forum*, no. 3 (2006), pp. 27–36. See also the Hamburg Centre for Biological Arms Control website at URL <http://www.biological-arms-control.org/projects/CBM_en.htm>.

²³ UN Security Council Resolution 1373, 28 Sep. 2001; and UN Security Council Resolution 1540, 28 Apr. 2004. See the discussion of Resolution 1737 in chapter 15 and of Resolution 1540 in appendix 11A in this volume. Resolution 1540 is reproduced as appendix 11B in this volume. See also the 1540 Committee website at URL <<http://disarmament2.un.org/Committee1540/>>. These and other UN Security Council resolutions discussed in this chapter are available at URL <<http://www.un.org/documents/scres.htm>>.

As at the 1996 Fourth Review Conference of the BTWC, in 2006 Iran tabled a proposal to amend Article I of the convention to explicitly include a prohibition against the 'use' of BW and stated that it had requested the depositaries of the convention (Russia, the United Kingdom and the USA) to start the amendment process.²⁴ Iran argued that the amendment is necessary in part because the prohibition of use contained in the 1925 Geneva Protocol is insufficient since many of the parties to the protocol had or maintain reservations that leave open the possibility of using CBW.²⁵ The other delegations generally opposed amending the BTWC because this could open the door for other amendments. The final document of the Sixth Review Conference, like that of the Fourth Review Conference, states that the parties understand the prohibitions of Article I to include a ban on the use of BW.²⁶

Russia proposed that the term 'biological weapon' should be more precisely defined on the basis of the type and quantity of biological agents that are allowed for non-prohibited purposes, but the proposal failed to gain support.²⁷ Concern continued that narrowing the definition would undermine the general purpose criterion embodied in the Article I prohibition against BW, which bans all 'microbial, other biological agents, or toxins whatever their origin or method of production' except for non-prohibited purposes.²⁸ The general purpose criterion is the principal mechanism for ensuring that the BTWC can be applied regardless of future scientific and technological developments.²⁹ There is also concern that an agreement on a quantitative declaration threshold could weaken the convention because large quantities of biological agents can be grown quickly from small initial feedstocks. The conference's final document reaffirmed that Article I applies to 'all scientific and technological developments in the life sciences and other fields of science relevant to the Convention'.³⁰

²⁴ Sixth BTWC Review Conference, 'Prohibition of use of biological weapons, submitted by the Islamic Republic of Iran', document BWC/CONF.VI/WP.25, 23 Nov. 2006, paras 3–4. See also Zanders, J. P. and Eckstein, S., *The Prohibition of 'Use' under the BTWC: Backgrounder on Relevant Developments during the Negotiations, 1969–1972* (SIPRI: Stockholm, 3 Dec. 1996), URL <<http://www.sipri.org/contents/cbwarfare/Publications/Publications/cbw-papersfactsheets.html>>.

²⁵ The BTWC's preamble reaffirms the Geneva Protocol's principles and objectives. Iran's position implies that any divergence between how the 2 agreements are interpreted and implemented could constitute a loophole that states wishing to retain the option of using BW might exploit. However, this interpretation is contrary to the spirit of the BTWC and the general international understanding of its prohibitions, including that expressed in the final documents of both the fourth and sixth review conferences.

²⁶ Sixth BTWC Review Conference, 'Final document', document BWC/CONF.VI/6, 20 Nov.–8 Dec. 2006, p. 9.

²⁷ Tucker, J. B. (interview by P. Crail), Monterey Institute of International Studies Center for Non-proliferation Studies, 'The Sixth Review Conference of the Biological Weapons Convention: success or failure?', 4 Jan. 2007, URL <<http://cns.miis.edu/pubs/week/070104.htm>>.

²⁸ Regardless of its phrasing, a definition of BW that is narrower in scope than the general purpose criterion would risk narrowing the application of the BTWC's prohibition against such weapons.

²⁹ BTWC (note 1), Article I.

³⁰ Sixth BTWC Review Conference (note 26), p. 9. For background on scientific and technological challenges see Tucker, J. B. and Zilinskas, R. A., 'The promise and perils of synthetic biology', *New Atlantis*, spring 2006, pp. 25–45, URL <<http://www.thenewatlantis.com/archive/12/tuckerzilinskas.htm>>. See also Littlewood, J., *The Biological Weapons Convention: A Failed Revolution* (Ashgate: Aldershot, 2005).

The inter-sessional programme for 2007–10 will consist of four annual meetings of one-week duration to ‘discuss, and promote common understanding and effective action’ on: (a) ways and means to enhance national implementation, (b) regional and subregional cooperation on BTWC implementation, (c) national, regional and international measures to improve bio-safety and bio-security, (d) oversight, education, awareness raising and development of codes of conduct, (e) capacity building in the fields of disease surveillance, detection, diagnosis and containment of infectious diseases; and (f) assistance and coordination with relevant organizations at the request of any BTWC party in case of alleged BW use.³¹ The issue of an institutionalized verification structure remains formally in abeyance despite concern that the absence of some such form of oversight could gradually erode the international legal norm against BW. The usefulness of the annual meetings will depend on the extent to which they promote effective implementation of the BTWC.³²

III. Chemical weapon disarmament

As of December 2006, 181 states had ratified or acceded to the 1993 Chemical Weapons Convention; an additional 6 states had signed but not ratified the convention, and 8 states had neither signed nor ratified it.³³

The Conference of the States Parties

The 11th Conference of the States Parties to the CWC met on 5–8 December 2006. The parties devoted much attention to the issue of the destruction of CW stockpiles and took a number of procedural decisions.³⁴ The verification of non-production of chemical weapons by the chemical industry—essential for maintaining the effectiveness of the convention—was also considered. The CSP approved the OPCW’s 2007 budget of €75 025 751 (\$99 700 000), a decrease of €588 490 (\$765 000) over the 2006 budget. It is the second con-

³¹ Sixth BTWC Review Conference (note 26), p. 21.

³² On institutional issues see Zanders, J. P., ‘Verification of the BTWC: seeking the impossible or impossible to seek?’, ed. G. Lindstrom, *Enforcing Non-Proliferation: The European Union and the 2006 BTWC Review Conference*, Chaillot Paper no. 93 (European Union Institute for Security Studies: Paris, Nov. 2006), pp. 50–54.

³³ The Central African Republic, Comoros, Djibouti, Haiti, Liberia and Montenegro became parties to the CWC in 2006. The CWC entered into force for Montenegro on 3 June 2006, the date of the country’s independence (until 2006 Montenegro was part of Serbia and Montenegro). The states that have signed, but not ratified the CWC are Bahamas, Republic of the Congo, Dominican Republic, Guinea-Bissau, Israel and Myanmar (Burma). The states that had not signed or ratified the CWC as of Dec. 2006 were Angola, Barbados, Egypt, Iraq, Lebanon, North Korea, Somalia and Syria. See also annex A in this volume.

³⁴ CW destruction in Russia is also a major focus of the Group of Eight (G8) industrialized countries’ Global Partnership against the Spread of Weapons and Materials of Mass Destruction activities. On the Global Partnership see chapter 12 in this volume.

secutive 'zero nominal growth' budget. The CSP earmarked €37 545 676 (\$49 900 000) to cover verification costs.³⁵

The CSP granted the OPCW Director-General the authority, effective until 29 April 2012, to extend and renew employment contracts beyond the seven-year total length of service that was specified by a 2003 CSP decision.³⁶ The CSP also extended for one year the OPCW's Plan of Action for the implementation of the obligations of Article VII (national implementation measures).³⁷ As of 1 November 2006, 172 of the parties (95 per cent) had established or designated a national authority; 112 parties (62 per cent) had reported to the Technical Secretariat the adoption of legislative and administrative measures to implement the CWC; and 72 parties (40 per cent) had adopted and reported on national legislation covering all key areas required by the CWC.³⁸ The CSP also requested that all states parties and the Technical Secretariat intensify their efforts to promote the convention's universality with a view towards achieving universal adherence by 29 April 2007.³⁹ The Technical Secretariat continued to document its operating procedures and to facilitate the transfer of institutional memory and expertise to future staff.

Chemical industry verification

At the 11th CSP and an Executive Council meeting that met parallel to it much attention focused on the verification regime covering other chemical production facilities (OCPFs). The CWC verification regime covers some plant sites that produce by synthesis certain discrete organic chemicals some of which contain the elements phosphorus, sulphur or fluorine (DOC/PSFs). Facilities that produce DOC/PSFs according to the guidelines in the CWC Verification Annex are called OCPFs. They must be declared to the OPCW and are subject to inspection.⁴⁰ A credible methodology for OCPF site selection and the carrying out of a sufficient number of geographically balanced inspections of such sites are necessary in order to ensure the effectiveness of the CWC verification regime. Some OCPF facilities are multi-purpose chem-

³⁵ Organisation for the Prohibition of Chemical Weapons (OPCW), 'Decision, programme and budget of the OPCW for 2007', document C-11/DEC.11, 8 Dec. 2006. For OPCW documents see URL <<http://www.opcw.org>>.

³⁶ With the exception of local staff, translators and interpreters, no OPCW staff member may have a total length of service exceeding 7 years by 2012. OPCW, 'Decision, tenure policy of the OPCW', document C-SS-2/DEC.1, 30 Apr. 2003; and OPCW, 'Decision, future implementation of the tenure policy', document C-11/DEC.7, 7 Dec. 2006.

³⁷ OPCW, 'Decision, sustaining follow-up to the plan of action regarding the implementation of Article VII obligations', document C-11/DEC.4, 6 Dec. 2006.

³⁸ OPCW, 'Note by the Director-General, report to the Conference of the States Parties at its eleventh session on the status of implementation of Article VII of the Chemical Weapons Convention as at 1 November 2006', document C-11/DG.6, 23 Nov. 2006, p. 5.

³⁹ OPCW, 'Decision, universality of the Chemical Weapons Convention and the further implementation of the universality action plan', document C-11/DEC.8, 7 Dec. 2006. See Guthrie, R., Hart, J. and Kuhlau, F., 'Chemical and biological warfare developments and arms control', *SIPRI Yearbook 2006: Armaments, Disarmament and International Security* (Oxford University Press: Oxford, 2006), pp. 715–16.

⁴⁰ CWC (note 2), Verification Annex, Part IX.

ical production facilities that can be reconfigured on short notice in order to produce a wide range of toxic chemicals that could be diverted to purposes prohibited by the CWC.⁴¹

The listing of chemicals in the Annex on Chemicals is meant to balance the risk they pose to the object and purpose of the CWC against the fact that such chemicals can often be used for peaceful, including commercial, purposes. The annex comprises three schedules: schedule 1 chemicals pose a ‘high risk’ to the object and purpose of the convention and have the fewest applications for peaceful purposes; schedule 2 chemicals pose a ‘significant risk’; and schedule 3 chemicals pose ‘a risk’, although they have the widest application for peaceful purposes.⁴² The verification regime for OCPFs targets facilities that produce chemicals that are not listed on the schedules but that may nevertheless present a threat to the convention. Inspections focus on the facilities, rather than on the chemicals they produce, and their primary aim is to confirm the absence of activities involving schedule 1 chemicals.

The extent to which OCPF inspections are carried out on the territory of parties with developed or developing chemical industries is another implementation issue. Parties with developing chemical industries tend to emphasize maintaining the ‘hierarchy of risk’ embodied in the CWC Annex on Chemicals.⁴³ Parties with more developed chemical industries, however, often stress the need for a better spread of OCPF inspections in order to preserve the equitable geographic distribution principle inherent to the operation of UN bodies and to effectively address potential proliferation concerns. The CWC specifies ‘equitable geographical distribution’ as a criterion for the selection of DOC/PSF plant sites for inspection.⁴⁴ The low number of OCPF inspections, both in absolute terms and as a percentage of total declared facilities, is considered by some as putting at risk the credibility of the overall CWC verification regime. At present, the OPCW annually inspects fewer than 2 per cent of the more than 5000 OCPFs that are subject to inspection. The number of declared OCPFs is also continuing to rise.⁴⁵ The optimization of the OCPF

⁴¹ In 2003 the OPCW Scientific Advisory Board concluded that it would be ‘prudent’ to increase the number of OCPF inspections while maintaining the effectiveness of the verification regime for chemicals listed in the CWC Annex on Chemicals. It also stated that ‘suitable training must be provided’ to ensure that OPCW inspectors are familiar with new chemical production routes and processes. OPCW, ‘Note by the Director-General, report of the Scientific Advisory Board on developments in science and technology’, document RC-1/DG.2, 23 Apr. 2003, para. 2.3, p. 2. Many OCPFs selected for inspection in the early years of the CWC’s implementation were single-purpose facilities that produced bulk chemicals or chemicals such as urea which have little relevance to the CWC. The selection process was later improved to include more multi-purpose facilities. In response to the CWC parties’ nominating sites for inspection—in accordance with the CWC Verification Annex, Part IX, para. 11(c)—concern has been expressed that plant site selection should not overly rely on nominations by the parties to be inspected.

⁴² CWC (note 2), Annex on Chemicals, ‘Guidelines for Schedules of Chemicals’.

⁴³ E.g. the parties periodically consider whether small laboratories that synthesize a few milligrams of a schedule 1 chemical annually should be considered as posing a greater risk to the object and purpose of the CWC than multi-purpose facilities that are capable of producing thousands of tonnes of toxic DOC/PSFs annually.

⁴⁴ CWC (note 2), Verification Annex, Part IX, para. 11(a).

⁴⁵ E.g. in 2005 the OPCW conducted 80 inspections of OCPF sites out of a total of 4702 OCPF sites that are subject to inspection. OPCW, ‘Report of the OPCW on the implementation of the Convention on

verification regime offers insight into the challenges of implementing at the operational level the provisions of the CWC that are broadly phrased.

Destruction of chemical weapons

The verification of the destruction of chemical weapons is a core objective of the CWC: all CW stockpiles must be destroyed by 29 April 2007, although the deadline may be extended by up to five years (until 29 April 2012). As of 31 December 2006, of approximately 71 330 agent tonnes of declared chemical weapons, about 16 600 agent tonnes had been verifiably destroyed; and of approximately 8.67 million declared items, about 2.64 million munitions and containers had been destroyed.⁴⁶ As of the same date, 12 states had declared 65 chemical weapon production facilities, of which 39 had been destroyed and 18 converted to peaceful purposes not prohibited by the CWC.⁴⁷ The states that have declared their possession of chemical weapons are Albania, India, Libya, Russia, the USA and a state that has not been officially identified by the OPCW (generally understood to be South Korea). Indications increased that Russia and the USA will not be able to complete the destruction of their CW stockpiles by 29 April 2012.⁴⁸

The CSP's willingness to extend the Russian and US deadlines to 2012 was facilitated by an understanding that, starting no later than 2008, the two countries will periodically host visits by representatives of the Executive Council to chemical weapon destruction facilities (CWDFs) or CWDF construction sites.⁴⁹ The Executive Council, which met parallel to the CSP, agreed the modalities for these visits.⁵⁰ The OPCW Director-General emphasized that the visits should supplement but not replace the OPCW inspection regime,⁵¹ while the EU offered to provide financial support, on an individual basis, to promote 'adequate geographical' representation in the teams.⁵²

the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapon and on their Destruction', document C-11/4, 6 Dec. 2006, pp. 4, 8.

⁴⁶ OPCW official, Communication with J. Hart, 12 Feb. 2007. For periodic updates see also OPCW, 'The chemical weapons ban: facts and figures', URL <<http://www.opcw.org>>.

⁴⁷ The states are Bosnia and Herzegovina, China, France, India, Iran, Japan, South Korea, Libya, Russia, Serbia, the UK and the USA. OPCW, 'The chemical weapons ban: facts and figures', URL <<http://www.opcw.org>>. The CWC defines a chemical weapon production facility as one that has produced chemical weapons at any time since 1 Jan. 1946. CWC (note 2), Article II, para. 8. For quantity and type of CW stockpiles and associated destruction programmes see CBW chapters in previous editions of the SIPRI Yearbook.

⁴⁸ Ember, L., 'Chemical weapons deadline at risk: Russia, even U.S., is not likely to destroy its arsenals completely by 2012 as mandated by treaty', *Chemical & Engineering News*, vol. 84, no. 16 (17 Apr. 2006), pp. 27–30.

⁴⁹ The circumstances under which other CW possessor states might receive such visits were unclear.

⁵⁰ OPCW, 'Decision, visits by representatives of the Executive Council', document C-11/DEC.20, 8 Dec. 2006.

⁵¹ OPCW, 'Opening statement by the Director-General to the Conference of the States Parties at its eleventh session', document C-11/DG.9, 5 Dec. 2006, para. 10, p. 2.

⁵² OPCW, 'Statement by H. E. Markus Lyra, Under-Secretary of State, Finland, on behalf of the European Union', 11th CSP, The Hague, 5–8 Dec. 2006, URL <<http://www.opcw.org/docs/csp/csp11/en/FIN-en.pdf>>.

Albania's stockpile, which consists mainly of sulphur mustard, will be destroyed through high-temperature pyrolysis. As of September 2006, the USA had spent \$38.5 million to support CW destruction in Albania.⁵³ The 11th CSP granted Albania intermediate deadline extensions to destroy its category 1 chemical weapons.⁵⁴

India declared a CW stockpile of approximately 1044 agent tonnes.⁵⁵ The 11th CSP granted India an extension to destroy its category 1 chemical weapons no later than 28 April 2009, on the condition that it periodically provides additional information to the OPCW on the progress of destruction.⁵⁶

Libya's remaining CW stockpile consists primarily of CW precursors and sulphur mustard. The 11th CSP granted it an extension to destroy its category 1 chemical weapons by 31 December 2010, providing Libya supplies further information to the OPCW on the progress of destruction.⁵⁷ An extension of intermediate destruction deadlines was also granted for category 1 CWs on similar conditions.⁵⁸ The US Department of Defense (DOD) has estimated that assisting Libya to destroy its stockpile will cost \$100 million.⁵⁹

The *Russian* CW stockpile is stored at six locations.⁶⁰ In March 2006 a second unit at the Kambarka CWDF became operational, and the first unit of the CWDF at Maradikovskiy became operational in September.⁶¹ CWDFs at Leonidovka, Pochep and Shchuchye are scheduled to become operational in 2008, while the last CWDF, located at Kizner, is scheduled to become operational in

⁵³ Squassoni, S., *Globalizing Cooperative Threat Reduction: A Survey of Options*, US Library of Congress, Congressional Research Service (CRS) Report for Congress RL32359 (CRS: Washington, DC, 5 Oct. 2006), p. 1. See also chapter 12 in this volume.

⁵⁴ OPCW, 'Decision, extensions of the intermediate deadlines for the destruction by Albania of its category 1 chemical weapons', document C-11/DEC.19, 8 Dec. 2006. The definition of CW categories, which is partly based on what schedule a chemical may be listed under, is given in CWC (note 2), Verification Annex, Part IV(A), para. 16.

⁵⁵ Perry Robinson, J. P., 'Near-term development of governance regime for biological and chemical weapons', Science & Technology Policy Research Unit paper, item 456, Brighton, 4 Nov. 2006, ref. 77, URL <<http://www.sussex.ac.uk/Units/spru/nonstateactors/uploads/GovernanceRegimePaper.pdf>>.

⁵⁶ OPCW, 'Decision, request by India for an extension of the deadline for destroying all of its category 1 chemical weapons', document C-11/DEC.16, 8 Dec. 2006.

⁵⁷ See Hart, J. and Kile, S. N., 'Libya's renunciation of nuclear, biological and chemical weapons and ballistic missiles', *SIPRI Yearbook 2005: Armaments, Disarmament and International Security* (Oxford University Press: Oxford, 2005), pp. 643–45.

⁵⁸ OPCW, 'Decision, proposal by the Libyan Arab Jamahiriya for the establishment of specific dates for intermediate destruction deadlines, and its request for an extension of the final deadlines for the destruction of its category 1 chemical weapons', document C-11/DEC.15, 8 Dec. 2006.

⁵⁹ 'U.S. considers aiding Libyan CW disposal', *Global Security Newswire*, 31 Mar. 2006, URL <http://www.nti.org/d_newswire/issues/2006_3_31.html>.

⁶⁰ The locations are Kambarka, Udmurtia Republic; Kizner, Udmurtia Republic; Maradikovskiy, Kirov oblast; Pochep, Bryansk oblast; Leonidovka, Penza oblast; and Shchuchye, Kurgan oblast. On Russian CW destruction see 'Unichtozhenie khimicheskogo oruzhiya v R.F.' [Destruction of chemical weapons in the Russian Federation], *Rossiiskaya Gazeta*, URL <<http://www.rg.ru/ximiya.html>>; and *Khimicheskoe Razoruzhenie: Otkrytyy Elektronny Zhurnal* [Chemical disarmament: open electronic journal], URL <<http://www.chemicaldisarmament.ru/>>. Destruction operations at Gorny, Saratov oblast, were completed in Dec. 2005.

⁶¹ ITAR-TASS, Magasumavo, R., 'Ob'ekt po unichtozheniyu khimoruzhiya v Maradykovo pushchen v ekspluatatsiyu' [Chemical weapon destruction facility at Maradykovo enters operation], 8 Sep. 2006, URL <<http://www.chemicaldisarmament.ru/print/695.html>>.

2009.⁶² The 11th CSP granted an extension for Russia to complete the destruction of 45 per cent of its category 1 chemical weapons by 31 December 2009, and 29 April 2012 was set as the deadline for Russia to complete the destruction of its CW stockpile.⁶³ As of 5 December 2006, Russia had destroyed 3123 tonnes of blister agent and 2925 tonnes of organophosphorus nerve agent, accounting for approximately 15 per cent of its original stockpile of 40 000 agent tonnes.⁶⁴

One party to the CWC (widely understood to be *South Korea*) has declared possession of a CW stockpile but has declined to identify itself. The party in question has declared a stockpile of approximately 1056 agent tonnes.⁶⁵ The 11th CSP granted an extension to 'a state party' to destroy its category 1 chemical weapons by 31 December 2008, on the condition that it periodically provides additional information to the OPCW on the progress of destruction.⁶⁶

The estimated cost of destroying *the United States'* stockpile, which is stored at seven locations, was expected to reach \$35 billion.⁶⁷ Approximately 40 per cent of the US stockpile has been destroyed. In 2006 CW destruction was completed at Aberdeen, Maryland, the second storage and disposal site (of an original nine sites). On 10 April 2006, the Secretary of Defense, Donald Rumsfeld, notified the US Congress that current estimates indicate that the USA will be able to destroy approximately 66 per cent of its CW stockpile by 2012.⁶⁸ This implies that the USA will complete the destruction of its stockpiled chemical weapons by about 2017. The 11th CSP granted the USA an extension to destroy its category 1 chemical weapons no later than 29 April 2012, providing that it periodically supplies further information to the OPCW on the progress of destruction and that this progress be periodically reviewed

⁶² For an update on the Shchuchye CWDF see US Government Accountability Office (GAO), *Cooperative Threat Reduction: DOD Needs More Reliable Data to Better Estimate the Cost and Schedule of the Shchuch'ye Facility*, Report no. GAO-06-692 (GAO: Washington, DC, May 2006).

⁶³ OPCW, 'Decision, proposal for a date for the completion of phase 3 of the destruction by the Russian Federation of its category 1 chemical weapons', document C-11/DEC.14, 8 Dec. 2006; and OPCW, 'Decision, proposal by the Russian Federation on setting a specific date for completion of the destruction of its stockpiles of category 1 chemical weapons', document C-11/DEC.18, 8 Dec. 2006.

⁶⁴ Statement of the Russian delegation to the OPCW, 'Statement by Mr. Victor Kholstov, Head of the Russian delegation to the eleventh session of the Conference of the States Parties to the Chemical Weapons Convention', The Hague, 5–8 Dec. 2006. Some parties maintain that the percentage should be lower because they do not consider that a single hydrolysis step is sufficient to meet the 'end point of destruction' criterion in the convention, which requires that destruction be 'essentially irreversible'. CWC (note 2), Verification Annex, Part IV(A), para. 12.

⁶⁵ Perry Robinson (note 55).

⁶⁶ OPCW, 'Decision, request by a state party for an extension of the final deadline for destroying all its category 1 chemical weapons', document C-11/DEC.12, 8 Dec. 2006.

⁶⁷ The locations are Anniston Chemical Agent Disposal Facility, Anniston, Alabama; Blue Grass Chemical Agent Disposal Pilot Plant, Blue Grass, Kentucky; Newport Chemical Agent Disposal Facility, Newport, Indiana; Pine Bluff Chemical Agent Disposal Facility, Pine Bluff, Arkansas; Pueblo Chemical Agent Disposal Plant, Pueblo, Colorado; Tooele Chemical Agent Disposal Facility, Tooele, Utah; and Umatilla Chemical Agent Disposal Facility, Umatilla, Oregon. US Department of State, 'US requests chemical weapons destruction deadline extension', Washington, DC, 7 July 2006, available at URL <<http://usinfo.state.gov/>>.

⁶⁸ 'U.S. can't destroy its chemical arms by 2012', *Chemical & Engineering News*, vol. 84, no. 16 (17 Apr. 2006), p. 26; and Ember, L., 'U.S. can't eliminate arsenal until 2017', *Chemical & Engineering News*, vol. 84, no. 17 (24 Apr. 2006), p. 9.

by the Executive Council and the results shared with other parties on request.⁶⁹ Much of the discussion about the US programme centred on the treatment and disposal of caustic VX (a nerve agent) hydrolysate from the Newport CW destruction facility and whether the US Army should transport it for off-site treatment.⁷⁰

Old, abandoned and sea-dumped chemical weapons

As of 31 December 2006, three countries had declared that abandoned chemical weapons are present on their territories, and 13 countries had declared that they possess old chemical weapons.⁷¹

In 2006 the United States Congress drafted legislation to address issues connected with the disposal of chemical weapons by sea dumping. These issues include concern about chemical weapons dumped at three or more locations off the coast of Hawaii until the end of the 1960s,⁷² as well as more general concerns arising from the 2001 publication of a US Army report on past CW dumping which indicated that the practice had been more frequent and widespread than previously thought.⁷³ In 2006 operations to dispose of at least

⁶⁹ OPCW, 'Decision, request by the United States of America for establishment of a revised date for the final deadline for destroying all of its category 1 chemical weapons', document C-11/DEC.17, 8 Dec. 2006. For background see US Department of State, 'United States of America, request for establishment of a revised date for the phase 4 deadline for the destruction of category 1 chemical weapons (CW) in the United States', Washington, DC, 2006, URL <<http://www.state.gov/documents/organization/64997.pdf>>.

⁷⁰ US Department of Health and Human Services, Centers for Disease Control and Prevention, 'Review of the revised plan for off-site treatment of Newport Chemical Agent Disposal Facility's caustic VX hydrolysate at DuPont Secure Environmental Treatment Facility in Deepwater, New Jersey', July 2006, URL <<http://www.cdc.gov/nceh/demil/>>.

⁷¹ The countries that have declared abandoned chemical weapons to the OPCW are China, Italy and Panama. The countries that have declared old chemical weapons to the OPCW are Austria, Australia, Belgium, Canada, France, Germany, Italy, Japan, Marshall Islands, Russia, Slovenia, the UK and the USA. Abandoned chemical weapons are defined as CW that were abandoned by a state after 1 Jan. 1925 on the territory of another state without the permission of the latter. CWC (note 2), Article II, para. 6. Old chemical weapons are defined as CW that were produced before 1925 or CW produced between 1925 and 1946 that have deteriorated to such an extent that they are no longer usable for the purpose for which they were designed. CWC (note 2), Article II, para. 5.

⁷² Bearden, D. M., *US Disposal of Chemical Weapons in the Ocean: Background and Issues for Congress*, US Library of Congress, Congressional Research Service (CRS) Report for Congress RL33432 (CRS: Washington, DC, 24 May 2006). CW munitions dumped off the US coasts included 1100 1000-pound (lb) (454-kg) cyanogen chloride-filled bombs; 20 1000-lb (454-kg) hydrogen cyanide-filled bombs; 125 500-lb (227-kg) cyanogen chloride-filled bombs; 15 000 115-lb (52-kg) sulphur mustard-filled bombs; 31 000 sulphur mustard-filled mortar shells; 1000 one-ton bulk storage containers filled with sulphur mustard; 190 one-ton bulk storage containers filled with lewisite; 16 000 100-lb (45-kg) sulphur mustard bombs; and 4220 tons of assorted ordnance filled with hydrogen cyanide. US Senate bill S.2295, 'Hawaiian waters chemical munitions safety act of 2006', 109th Congress (2005–2006), URL <<http://www.govtrack.us/congress/billtext.xpd?bill=s109-2295>>. As of Dec. 2006 the bill was apparently still in committee. The bill cites US Department of Defense, US Army Research, Development, and Engineering Command, Aberdeen Proving Ground, Md., Corporate Information Office, Historical Research and Development Team, 'Off-shore disposal of chemical agents and weapons conducted by the United States', 29 Mar. 2001.

⁷³ Kakesako, G., 'Isle lawmakers seeking survey of weapons sites', *Star Bulletin*, 17 Feb. 2006, URL <<http://starbulletin.com/2006/02/17/news/story06.html>>. CW produced after World War II that were dumped at sea are not considered to be old or abandoned chemical weapons. CWs dumped before 1 Jan. 1985 also need not be declared to the OPCW.

137 suspected CW munitions, including 4-inch (c. 10-cm) Stokes mortar rounds and at least one Livens Projector shell, continued at a military reservation on Oahu, Hawaii.⁷⁴ In addition to smoke rounds, some munitions contain chlorpicrin, a harassing agent (one designed to cause severe discomfort, but not death or permanent injury).⁷⁵

In 2006 Japan sent four investigation teams and five excavation and recovery teams to *China*, where more than 1700 projectiles were recovered. Both countries are working to identify and destroy chemical weapons that were abandoned in China by Japan in the 1930s and 1940s.⁷⁶

In *Germany* a third CWDF began operation in April 2006 at a facility on Lüneburg Heath near Munster. Small-calibre—2.3 kg trinitrotoluene (TNT) equivalent or less—conventional and CW munitions will be fed directly into the unit, an incinerator, without disassembly.⁷⁷

IV. Allegations of chemical and biological weapon violations and past programmes

Most of the information dealing with allegations of CBW programmes is provided by the USA and contained in various reports and statements that tend to provide similar listings of states in any given year.⁷⁸ In 2006 the USA stated that it ‘believes’ that *Iran* ‘probably has an offensive biological weapons program’; that it ‘believes’ that *North Korea* has a ‘biological warfare capability and may have developed, produced, and weaponized for use biological weapons’; and that *Syria* has carried out research and development (R&D) for

⁷⁴ The Livens Projector, named for a British engineer, is a drum-and-tube CW- or smoke-delivery system developed during World War I. The Stokes Trench Mortar was a similar system used in World War I by the US Army’s First Gas Regiment. Such systems were developed to be fired simultaneously in order to try to achieve sudden high concentrations of CW agent over enemy trench positions. See Foulkes, C. H., *“Gas!” The Story of the Special Brigade* (William Blackwood & Sons: Edinburgh, 1936).

⁷⁵ US Army Corps of Engineers, ‘Chemical munitions encountered during Schofield Barracks Military Reservation range clearance’, Presentation at the 9th International Chemical Weapons Demilitarisation Conference: CWD 2006, Lüneburg, 15–18 May 2006.

⁷⁶ Japanese delegation to the OPCW, ‘Statement by H. E. Mr. Takeshi Nakane, Ambassador, Director-General, Disarmament, Non-Proliferation and Science Department, Ministry of Foreign Affairs at the eleventh session of the Conference of the States Parties [to] the OPCW’, The Hague, 5 Dec. 2006, URL <<http://www.opcw.org/docs/csp/csp11/en/JP-en.pdf>>. On the type and quantity of CW in China see Nanaoka, S., Nomura, K. and Wada, T., ‘Determination of mustard and lewisite related compounds in abandoned chemical weapons (yellow shells) from sources in China and Japan’, *Journal of Chromatography A*, vol. 11101 (2006), pp. 268–77; and Science Council of Japan, *Risk Assessment of Old and Abandoned Chemical Weapons and Development of Safe Advanced Destruction Technologies* (Digital Print Co.: Ibaraki, Oct. 2006).

⁷⁷ Dynasafe, ‘The DYNASAFE SK 2000 for chemical munitions in Munster: one step destruction of old chemical weapons’, Presentation at the 9th International Chemical Weapons Demilitarisation Conference: CWD 2006 (note 75). Starting in World War I, the Munster military training ground was the principal German experimental and training area for CW. In 1919 approximately 1 million CW shells were scattered about the site when a train carrying munitions exploded. The site contains hundreds of thousands of World War I- and World War II-era conventional and CW munitions. The first CWDF (Munster I) began operation in the 1980s.

⁷⁸ On states not mentioned in this chapter see CBW chapters in previous editions of the SIPRI Yearbook.

an offensive BW programme.⁷⁹ Iran and Syria rejected the US allegations.⁸⁰ It is unclear what criteria the USA attaches to the term ‘capability’.⁸¹

Evidence was given in the judicial proceedings against *Chile*’s former president, Augusto Pinochet, alleging that his government maintained a clandestine CBW programme that was run by the secret police. The programme allegedly produced sarin and the causative agents for anthrax and botulism. An unspecified lethal bacterial agent was also reportedly developed by the programme and used to assassinate former president Eduardo Frei Montalvo in January 1982.⁸² If such a programme existed, it is not clear whether it was used to support a military BW capability or for assassination purposes.⁸³

In September 2006 a US Department of State official testified to the US–China Economic Security Review Commission that the USA has ‘reservations about *China*’s current research activities and dual-use capabilities, which raise the possibility that sophisticated CBW work could be underway’ partly because of a possible capability to aerosolize CBW agents for offensive use and apparent Chinese military involvement in such research. The official stated that the USA believes that China maintains ‘some elements of offensive BW capability in violation of its BWC obligations’ and ‘a CW production mobilization capacity’. She questioned China’s commitment to effectively implementing export controls on dual-purpose items that could support offensive CBW programmes.⁸⁴ China responded that the ‘accusations made by a

⁷⁹ Sixth BTWC Review Conference, ‘USA: confronting noncompliance with the Biological Weapons Convention’, document BWC/CONF.VI/WP.27* (reissued), 24 Nov. 2006, para. 7, p. 2. Iran and North Korea are parties to the BTWC; Syria has signed but not acceded to the convention.

⁸⁰ Sixth BTWC Review Conference, ‘Statement by H. E. Mr. Ali Moaiyeri, Ambassador Extraordinary and Plenipotentiary and Permanent Representative of the Islamic Republic of Iran before the Sixth Review Conference of the States Parties to the Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction (BWC)’, Geneva, 20 Nov. 2006, URL <<http://missions.itu.int/~missiran/sts2006/06112801BWC.pdf>>; and Pearson, G., ‘The Biological Weapons Convention Sixth Review Conference’, *CBW Conventions Bulletin*, no. 74 (Dec. 2006), pp. 10, 16.

⁸¹ US officials do not appear to have defined the term. Milton Leitenberg has stated that possible definitions include: (a) the procurement of dual-use equipment, (b) the possession of a well-developed pharmaceutical industry, and (c) various types of BW R&D work. See Leitenberg, M., *Assessing the Biological Weapons and Bioterrorism Threat* (Strategic Studies Institute, US Army War College: Carlisle, Pa., Dec. 2005), p. 15.

⁸² In Mar. 2005 Frei’s body was examined for traces of toxic chemicals after allegations by relatives that he was murdered with sarin. Three tissue samples, since discarded, reportedly indicated that he had been exposed to sulphur mustard. Spector, L. S., ‘Allegations of Pinochet biological weapons (BW) program underscore challenges of BW control’, *WMD Insights*, June 2006, URL <http://wmdinsights.org/16/16_LA1_AllegationsOfPinochet.htm>; Franklin, J., ‘Pinochet accused over murder of ex-president’, *The Guardian*, 18 May 2006; ‘Pinochet charged in Chile for murder of secret police chemist Eugenio Barrios’, *Santiago Times*, 12 May 2006, URL <http://www.tcgnnews.com/santiagotimes/index.php?nav=story&story_id=11286&topic_id=1>; and MercoPress, ‘Possible mustard gas poisoning of former Chilean president’, 22 Jan. 2007, URL <<http://www.mercopress.com/vernoticia.do?id=9693&formato=html>>.

⁸³ Eugenio Berrios, the alleged founder of such a programme, was killed on a beach near Montevideo, Uruguay, in 1995. Franklin (note 82).

⁸⁴ DeSutter, P., Assistant Secretary for Verification, Compliance, and Implementation, ‘The administration’s perspective on China’s record on nonproliferation’, Testimony before the US–China Economic Security Review Commission, Washington, DC, 14 Sep. 2006, URL <<http://www.state.gov/t/vci/rls/rm/72302.htm>>.

handful of American officials' were 'groundless and irresponsible' and reiterated its commitment to its arms control and non-proliferation obligations.⁸⁵

The trial in *Iraq* of members of Saddam Hussein's regime included charges of CW attacks against the Kurdish population of Iraq in the 1980s as part of the Anfal Campaign.⁸⁶ Saddam Hussein testified that the targets were not Iraqi citizens but Iranian agents and that 'any strike against Iran, be it with special ammunition, such as a chemical one, as it was alleged . . . I will take the responsibility with honor'.⁸⁷

Former biological weapon activities

Further research was presented in 2006 on post-World War II BW work conducted by a number of states, including Canada, France, the Soviet Union, the UK and the USA.⁸⁸ A major study of the Soviet Anti-Plague System and its role in the Soviet BW programme was also published (together with Wendy Orent) by Igor Domaradskij, a scientist who worked in the system in Soviet times.⁸⁹ The system continues to conduct valuable disease surveillance and response and research work in Russia and the other former Soviet states. Knowledge of how past BW programmes were carried out and their rationale is useful in promoting better understanding of how threat perceptions can influence decisions to pursue offensive BW or bio-defence work. Such analyses can also assist in understanding the international disarmament and non-proliferation measures that must be taken in order to destroy infrastructure that formerly supported offensive BW work or how to ensure that such infrastructure is used for non-hostile purposes only.

V. Remaining verification issues in Iraq

The United Nations Monitoring, Verification and Inspection Commission, UNMOVIC, remained excluded from Iraq in 2006, but it continued to docu-

⁸⁵ Chinese Ministry of Foreign Affairs, 'Foreign Ministry spokesman Qin Gang's comment on accusation by American officials against China of non-proliferation', Beijing, 18 Sep. 2006, URL <<http://www.fmprc.gov.cn/eng/xwfw/s2510/2535/t272376.htm>>. The USA did not include China in its statement at the Sixth BTWC Review Conference listing the parties it believes to be violating the convention.

⁸⁶ See 'Timeline: Anfal trial', BBC News, 8 Jan. 2007, URL <<http://news.bbc.co.uk/2/5272224.stm>>.

⁸⁷ Daragahi, B., 'Memos outline chemical plans', *Los Angeles Times*, 19 Dec. 2006; and Santora, M., 'Hussein's trial sees videotapes of chemical attacks on Kurds', *New York Times*, 20 Dec. 2006.

⁸⁸ Wheelis, M., Rózsa, L. and Dando, M., *Deadly Cultures: Biological Weapons Since 1945* (Harvard University Press: Cambridge, Mass., 2006).

⁸⁹ In the late 1890s the Russian Government created a commission to develop and implement measures to fight plague, which was then endemic in much of the country. This was done partly by establishing a system of research institutes and field stations—the Anti-Plague System—elements of which were later used to support the Soviet BW programme. See the articles in *Critical Reviews in Microbiology*, vol. 32, no. 1 (Jan.–Mar. 2006). See also Domaradskij, I. V. and Orent, W., 'Achievements of the Soviet biological weapons programme and implications for the future', *Revue Scientifique et Technique de l'Office International des Epizooties*, vol. 25, no. 1 (2006), pp. 153–61; and Domaradskij, I. V. and Orent, W., *Biowarrior: Inside the Soviet/Russian Biological War Machine* (Prometheus Books: Amherst, N.Y., 2003), an English-language version of his self-published memoirs: *Perevverytsh* [Troublemaker] (Moscow, 1995).

ment and analyse the lessons learned from its inspection experiences—and those of its predecessor the United Nations Special Commission on Iraq (UNSCOM)—in the country beginning in 1991. The future of the organization remained uncertain. Although there were indications of an increased desire among UN Security Council members ‘to wrap things up’, they continued to disagree on UNMOVIC’s future role, if any.⁹⁰ Discussions were also held on intelligence regarding Iraq’s weapons of mass destruction (WMD) holdings and capabilities prior to the 2003 US-led invasion of the country. Although some questions relating to Iraq’s CBW programmes remain unresolved, considerable progress has been made in verifying undeclared CW activities, including details about Iraq’s production of VX and confirmation that large amounts of filled and unfilled munitions and chemical agents have been destroyed.⁹¹ The BW programme was smaller than the other WMD programmes and BW production was not admitted by Iraq until 1995, when inspectors presented compelling evidence of such activities. UNMOVIC concluded that the BW programme may have been larger than declared by Iraq.⁹²

In 2006 the OPCW conducted a second and third training course, both held in Jordan, to assist Iraqi officials to prepare for implementing the provisions of the CWC.⁹³ Iraq also sent an observer delegation to the 11th CSP. On 7 April the permanent representative of Iraq to the UN wrote to the acting executive chairman of UNMOVIC stating Iraq’s intention to accede to the CWC, and on 30 May UNMOVIC provided Iraq with the relevant sections (edited to remove proliferation-sensitive content) of Iraq’s December 2002 declaration.⁹⁴ On 15 September and 10 October Iraqi officials were provided with CD-ROMs containing 1200 pages of documents with information requested by Iraq.⁹⁵

Pre-war intelligence and weapons of mass destruction

In 2006 the USA continued to debate the reliability of pre-war intelligence on Iraq. The debate focused on the organization of the intelligence community and the US Administration’s alleged politicization of the intelligence process to make a public case for war.⁹⁶ US Senator Rick Santorum and Congressman

⁹⁰ Kerr, P., ‘Three years later, Iraq investigations continue’, *Arms Control Today*, vol. 36, no. 3 (Apr. 2006), pp. 38–39.

⁹¹ UN Security Council, ‘Summary of the compendium of Iraq’s proscribed weapons programmes in the chemical, biological and missile areas’, UN document S/2006/420, 21 June 2006, pp. 45–47. For this and other UNMOVIC documents cited in this chapter see the UNMOVIC website, URL <<http://www.unmovic.org/>>. See also the CBW chapters in previous editions of the SIPRI Yearbook.

⁹² UN Security Council (note 91), pp. 59–68.

⁹³ OPCW, ‘OPCW conducts second Chemical Weapons Convention training for Iraq officials’, Press release no. 6, 15 Feb. 2006; and OPCW, ‘OPCW conducts third OPCW training for Iraqi officials’, Press release no. 99, 15 Dec. 2006.

⁹⁴ UN Security Council, ‘UNMOVIC 25th quarterly report’, UN document S/2006/342, 30 May 2006, pp. 2–3.

⁹⁵ UN Security Council, ‘UNMOVIC 27th quarterly report’, UN document S/2006/912, 22 Nov. 2006, p. 2.

⁹⁶ Pillar, P. R., ‘Intelligence, policy and the war in Iraq’, *Foreign Affairs*, vol. 85, no. 2 (Mar./Apr. 2006), pp. 15–27. See also chapters 1 and 5 in this volume.

Peter Hoekstra made public declassified information to help stimulate further debate on whether any WMD had actually been found in Iraq.⁹⁷ The report stated that, since 2003, some 500 munitions filled with degraded sarin and sulphur mustard have been found in Iraq; that more such unrecovered weapons exist; and that they risk falling into the hands of terrorists or insurgent groups.⁹⁸ Further calls were made for greater declassification of intelligence information on these issues.⁹⁹ These developments also raised questions about the way in which WMD that were present in Iraq before the 1991 Gulf War were addressed in the 2005 report of the Iraq Survey Group (ISG), a US-led body that searched for WMD in Iraq.¹⁰⁰ Charles Duelfer, special advisor to the Director of the US Central Intelligence Agency (CIA), stated in his 2004 comprehensive report on Iraq's WMD that Iraq had completed the destruction of its CW stockpile that had been produced before 1991. However, small numbers of CW munitions were found in 2004 and more may be found in the future.¹⁰¹ David Kay, who headed the ISG in 2003–2004, testified before the House Armed Services Committee that the chemical agents found were of such low quality that they did not constitute effective weapons and his report did not note them because the ISG did not concentrate on weapons that were produced before the 1991 Gulf War.¹⁰²

Verification lessons learned

In 2006 UNMOVIC continued to compile information on Iraq's proscribed weapon programmes. Because some information gathered in the larger compendium was sensitive, a summary was prepared of the inspections carried out by UNMOVIC and UNSCOM and made public in 2006.¹⁰³

Owing to the lack of procedures for conducting inspections, UNSCOM had to develop verification procedures to assess Iraq's compliance with its obligations under relevant UN Security Council resolutions. Key elements of and lessons learned about the verification process from the Iraq experience include

⁹⁷ US Office of the Director of National Intelligence, 'Unclassified, subject: Iraqi chemical munitions', 21 June 2006, URL <<http://intelligence.house.gov/Media/PDFS/DNILEtter.pdf>>.

⁹⁸ US Office of the Director of National Intelligence (note 97). Such CW remnants will continue to be uncovered and did not constitute a military CW capability in 2003.

⁹⁹ E.g. Federation of American Scientists, Project on Government Secrecy, 'Iraq intelligence reports are over classified, senators say', *Secrecy News*, 12 Sep. 2006, URL <http://www.fas.org/blog/secrecy/2006/09/iraq_intelligence_reports_are.html>.

¹⁰⁰ See US Central Intelligence Agency, 'Comprehensive report of the Special Advisor to the DCI on Iraq's WMD', 30 Sep. 2004; and US Central Intelligence Agency, 'Addendums to the Comprehensive report of the Special Advisor to the DCI on Iraq's WMD', Mar. 2005, URL <https://www.cia.gov/cia/reports/iraq_wmd_2004/>.

¹⁰¹ US Central Intelligence Agency, 'Key findings', vol. 3 (30 Sep. 2004), URL <https://www.cia.gov/cia/reports/iraq_wmd_2004/chap5.html#sect0>.

¹⁰² Kay, D. A., 'Statement prepared for the House Armed Services Committee Hearing on reports of weapons of mass destruction findings in Iraq', 29 June 2006, URL <http://www.globalsecurity.org/wmd/library/congress/2006_h/>.

¹⁰³ UN Security Council, 'Summary of the compendium of Iraq's proscribed weapons programmes in the chemical, biological and missile areas', UN document S/2006/420, 21 June 2006, pp. 2–3.

the need to: draw on a variety of verification experiences in disarmament and arms control; maintain some degree of consistency in staffing in order to build institutional stability, objectivity and staff accountability; have sufficient resources to perform inspections and maintain relevant data and supporting documentation; and recognize the benefits of multidisciplinary inspections with a mix of complementary expertise.¹⁰⁴ When UNMOVIC replaced UNSCOM it acquired verification technology, equipment and the means of transport through UN procurement procedures, rather than directly from the member states. This facilitated the development and implementation of standardized verification procedures and a high degree of operational readiness when planning and preparing for inspections. It also reduced the risk of surveillance activities beyond the inspection mandate. UNMOVIC has now trained inspectors from about 50 countries and maintains a roster of trained inspectors to serve in Iraq on short-term contracts in case it should be asked to return to Iraq in future.¹⁰⁵

Another lesson learned from the inspections in Iraq is the importance of understanding the verification conclusions that can be drawn from sampling and analysis results. These include: protecting against the perception that scientific results have proved or disproved an argument, guarding against both false-positive and false-negative test results, and implementing an agreed sampling and testing methodology at key points in a facility or location.¹⁰⁶ In one instance, UNSCOM found that the detection of conversion of a legitimate biological facility for BW purposes was ‘especially difficult since such activities had taken place only for a short period of time, and the site required only minor adjustments for the production of a biological warfare agent’.¹⁰⁷ UNSCOM sometimes assumed that Iraq would not or could not carry out certain activities because to do so would risk the health and safety of facility workers.¹⁰⁸ Inspectors also might not always have understood what they were seeing. For example, inspectors missed the modification to some R-400A bombs that enabled them to be used to deliver BW agents. This was partly because Iraq had already declared the bombs as chemical munitions and partly because Iraq had denied producing BW munitions.¹⁰⁹ UNSCOM’s experience demonstrated the importance of not relying excessively on sampling and

¹⁰⁴ UN Security Council (note 103), pp. 7–15.

¹⁰⁵ UN Security Council (note 103), pp. 17–18.

¹⁰⁶ UN Security Council (note 103), p. 66.

¹⁰⁷ UN Security Council (note 103), p. 67.

¹⁰⁸ E.g. UNSCOM was initially sceptical that Iraq had progressed beyond the R&D phase of a BW programme partly because, in the absence of conclusive evidence to the contrary, inspectors knew that, if liquid bacterial agent had been produced at al-Hakam, Iraqi workers would risk airborne contamination. However, it later became clear that Iraq had been prepared to accept such risks. UN Security Council (note 103), p. 67.

¹⁰⁹ UN Security Council (note 103), p. 67. The R-400 (a more general nomenclature for this type of munition) was designed for chemical fill and later as a binary CW. Most were empty at the time they were destroyed. In the mid-1990s it was revealed that Iraq had coated the interior of a small number of such munitions with a varnish in order to facilitate taking a BW fill.

analysis, of building an integrated information baseline and of being able to conduct interviews with Iraqis inside and outside the country.

UNMOVIC concluded that two major elements form the basis of an effective verification system: 'institutional knowledge encompassing the detailed experience and expertise gained from inspections and technical capabilities comprising verification technology and other necessary specialized assets'.¹¹⁰ The need to preserve such know-how is a major factor in favour of prolonging UNMOVIC's mandate or transforming it into an organization to help support a general UN inspection capability.¹¹¹ Analysis of information gathered from systematic and comprehensive collections in areas relating to sites or activities can often reveal indications of possible undeclared proscribed activity or lead to investigations of less obvious sources, and UNMOVIC could carry out such analyses. Such analyses of indicators and how they have been used would be useful in helping to develop a more systematic approach to an overall inspection methodology.¹¹²

VI. Bio-terrorism prevention and remediation

Much of the current international focus on attempting to prevent the intentional misuse of biological materials emphasizes implementing measures to promote bio-safety and bio-security, terms that are used to cover a wide variety of activities and expectations.¹¹³ Several types of institution and group have participated in activities in these fields, and each has a different perspective, mandate and set of institutional interests. Some cooperating institutions are partly concerned with acquiring new technology and equipment for themselves in the name of non-proliferation and safety efforts, while others are more interested in promoting increased transparency at biological defence establishments. Others are primarily interested in improving disease surveillance and response, pharmaceutical R&D, developing ethics and codes of conduct, or promoting good laboratory practice (GLP) and good manufacturing practice (GMP). For example, a survey of bio-security and bio-safety practices in Asia found that researchers were concerned mainly with accidental exposure to infectious agents, rather than intentional security breaches.¹¹⁴ One of the difficulties of assessing the effectiveness of bio-security and bio-safety measures is the uncertainty associated with the BW threat and risk assessments.

¹¹⁰ UN Security Council (note 103), p. 20.

¹¹¹ On the future of UNMOVIC see Guthrie, Hart and Kuhlau (note 39), pp. 725–27.

¹¹² UN Security Council (note 95), pp. 6–7.

¹¹³ In some languages, one word covers both concepts: e.g. *biobezopasnost'* (Russian) and *bio-säkerhet* (Swedish).

¹¹⁴ Sandia National Laboratories, *A Survey of Asian Life Scientists: The State of Biosciences, Laboratory Biosecurity, and Biosafety in Asia*, Report no. SAND2006–0842 (Sandia National Laboratories: Albuquerque, N.M., Feb. 2006),

This is especially true in cases where little or no historical record exists to serve as a guide.¹¹⁵

Preventive bio-security activities

In 2006 the UN Secretary-General, Kofi Annan, called for a global forum to encourage the spread of legitimate biotechnology in order to eliminate infectious diseases, while at the same time recognizing the potential harm if biotechnology is put to destructive use by those seeking to develop diseases and pathogens for illegitimate purposes. Annan suggested that risks arising from negligence or deliberate misuse could be dealt with by several measures, such as voluntary codes of conduct, legally binding systems and regulatory bodies to oversee sensitive research.¹¹⁶

The World Health Organization (WHO) published a document on bio-risk management and laboratory bio-security guidance in September 2006. It focused on bio-risk management through bio-safety, laboratory bio-security and ethical responsibility and encouraged its member states to develop national frameworks for the security of biological materials. In the absence of national regulatory guidance, laboratory managers are urged to consider bio-risk management. The WHO has defined laboratory bio-safety as ‘the containment principles, technologies and practices that are implemented to prevent the unintentional exposure of pathogens and toxins, or their accidental release’. Laboratory bio-security is defined as ‘the protection, control and accountability for valuable biological materials . . . within laboratories, in order to prevent their unauthorized access, loss, theft, misuse, diversion or intentional release’.¹¹⁷

On 8 September the UN General Assembly adopted the United Nations Global Counter-Terrorism Strategy, which provides an overarching systematic policy approach to combating terrorism. An attached plan of action ‘encourage[s]’ the Secretary-General to update the roster of experts and laboratories and technical guidelines and procedures in order to help ensure the ‘timely and efficient’ investigation of alleged CBW use; invites the UN system to develop a comprehensive database on biological incidents that is complementary to the planned Biocrimes Database being developed by the International Police Organization (Interpol); and encourages WHO to ‘step up’ its technical assistance to states to improve their public health systems in order to prevent and prepare for possible bio-terrorist attacks.¹¹⁸

¹¹⁵ See Roffey, R. and Kuhlau, F., ‘Enhancing bio-security: the need for a global strategy’, *SIPRI Yearbook 2006* (note 39), pp. 732–48; and *Globalization, Biosecurity, and the Future of the Life Sciences* (National Academies Press: Washington, DC, 2006).

¹¹⁶ UN News Centre, ‘Accepting a prize, Annan proposes global forum to address biotechnology’s benefits, risks’, 17 Nov. 2006, URL <<http://www.un.org/apps/news/story.asp?NewsID=20648&Cr=biotechnology&Cr1=>>>.

¹¹⁷ World Health Organization (WHO), *Biorisk Management: Laboratory Biosecurity Guidance* (WHO: Geneva, Sep. 2006), pp. iii–iv, 6.

¹¹⁸ United Nations, ‘United Nations Global Counter-Terrorism Strategy’, Plan of action: measures to prevent and combat terrorism, para. 11, and Measures to build states’ capacity to prevent and combat

US activities

The US DOD issued an 'instruction' in 2006 on minimum security standards for safeguarding 'biological select agents and toxins' (BSATs). It establishes security standards for BSATs in the custody or possession of the DOD to ensure their security from attack, theft, wrongful use and inappropriate transfer to unauthorized receivers. The measures cover personnel, information, physical and transport security as well as the requirements for inventory and accountability.¹¹⁹

In 2004 the USA addressed the issue of dual-use research (research that can have peaceful or hostile application) partly by establishing an oversight body, the National Science Advisory Board for Biosecurity, to aid policymakers and researchers in assessing risks associated with US Government-funded research in the life sciences. A 2006 report questioned whether the available tools are sufficient and effectively implemented and if additional measures should be developed.¹²⁰

The publication of a 2006 review of the US chemical industry infrastructure's vulnerability to possible terrorist attacks was delayed for several months by the US Department of Homeland Security out of concern that it contained classified information.¹²¹ The report concluded that a single terrorist attack could result in catastrophic loss of life and injuries but would probably adversely affect only the operation of individual companies and local economies. However, multiple terrorist incidents would have national implications.¹²² A bill authorizing more than \$973 million of expenditure for homeland security was signed into law by President George W. Bush on 4 October 2006. It authorizes the Secretary of Homeland Security to issue risk-based security standards for high-risk chemical facilities.¹²³

terrorism and to strengthen the role of the United Nations system in this regard, point 10, URL <<http://www.un.org/terrorism/strategy/>>. See also the Interpol bio-terrorism website, URL <<http://www.interpol.int/Public/BioTerrorism/>>; and the World Health Organization website on BW issues, URL <http://www.who.int/topics/biological_weapons/en/>.

¹¹⁹ US Department of Defense, 'Instruction', no. 5210.89, 18 Apr. 2006, URL <<http://www.fas.org/biosecurity/resource/reports.htm>>. This instruction implements policy and assigns responsibilities under DOD directive 5210.88 on safeguarding biological select agents and toxins.

¹²⁰ Shea, D. A., *Oversight of Dual-use Biological Research: The National Science Advisory Board for Biosecurity*, US Library of Congress, Congressional Research Service (CRS) Report for Congress RL33342 (CRS: Washington, DC, 28 Mar. 2006), pp. 2, 7–12.

¹²¹ National Research Council, Committee on Assessing Vulnerabilities Related to the Nation's Chemical Infrastructure, *Terrorism and the Chemical Infrastructure: Protecting People and Reducing Vulnerabilities* (National Academies Press: Washington, DC, 2006), URL <<http://books.nap.edu/catalog/11597.html>>; and Kosal, M., 'Terrorism targeting industrial chemical facilities: strategic motivations and the implications for US security', *Studies in Conflict and Terrorism*, vol. 30, no. 1 (Jan. 2007), pp. 41–73. See also Ember, L., 'Terrorism and the chemical industry', *Chemical & Engineering News*, vol. 84, no. 27 (3 July 2006), p. 25. The review investigated how best to invest in R&D and technology to make the chemical infrastructure more secure and able to withstand a terrorist attack or catastrophic accident. The committee was asked to focus on vulnerabilities of the chemical supply chain and the processes and key chemicals whose disruption might cause economic or human damage, and not the vulnerabilities of individual facilities, which would duplicate the work of other government efforts.

¹²² National Research Council (note 121), pp. 2–4.

¹²³ Ember, L., 'Congress focuses on security before adjourning', *Chemical & Engineering News*, vol. 84, no. 41 (9 Oct. 2006), p. 10.

EU activities

A harmonized EU standard for biological ‘select agents’ does not exist. However, the European Commission Directorate-General for Justice, Freedom and Security is preparing a Green Paper on bio-preparedness (expected to be published in early 2007) that will call for preventive bio-security measures, and recommend the creation of a European strategy on bio-security.¹²⁴ This consultation paper will cover issues in the civil sector such as industry and research in the life sciences. A number of other relevant projects on bio-safety and bio-security have been launched, two of them in 2006, under the EU’s Framework Programme 6 (FP6), the EU’s main instrument for research funding in Europe. The Bio-safety–Europe project recently started an inventory of safety and security in P3 and P4 laboratories in Europe.¹²⁵ The project promotes the ‘coordination, harmonisation and exchange of biosecurity practices within a pan European network’. It establishes a network of bio-safety experts and a website that includes an updatable inventory of information relevant to bio-safety and bio-security. A second FP6 project, BIOSAFE, is intended to strengthen the ability of public health and civil protection authorities to respond to the deliberate use of biological agents by terrorists, partly by establishing a European-wide network and a database information system. The project will evaluate the virulence factors of pathogens and toxins that could be used in acts of bio-terrorism.¹²⁶

The 2001 anthrax letter attacks in the United States

It remains unclear whether the perpetrators of the 2001 attacks in the USA with anthrax spore-laden letters were domestic or foreign and, if domestic, the extent to which a non-state actor may have been involved.¹²⁷ It has been argued that a limited number of individuals with experience of working in US bio-defence programmes were responsible. This reasoning is partly based on the view that the *Bacillus anthracis* spores were ‘highly refined’. In the view of some, the spores were also treated with additives to enhance the ability to aerosolize the particles (e.g. to prevent clumping). Both factors may suggest sophisticated engineering skills of a type that would normally only be found in a state-run R&D programme.¹²⁸

¹²⁴ Bio-preparedness in this case is a general term that refers to both preventive and responsive measures such as bio-security, preparedness and response.

¹²⁵ EU Sixth Framework Programme, ‘Project fact sheet: biosafety–Europe’, URL <<http://cordis.europa.eu/fp6/dc/index.cfm?fuseaction=UserSite.FP6HomePage>>. P3 and P4 refer to the physical-containment levels of laboratories, with P4 being the most secure.

¹²⁶ EU Sixth Framework Programme (note 125), ‘Project Fact sheet: BIOSAFE’. See also Kuhlau, F., *Countering Bio-Threats: EU Instruments for Managing Biological Materials, Technology and Knowledge*, SIPRI Policy Paper no. 19 (SIPRI: Stockholm, forthcoming 2007).

¹²⁷ For background see Zanders, J. P., Hart, J. and Kuhlau, F., ‘Chemical and biological weapon developments and arms control’, *SIPRI Yearbook 2002: Armaments, Disarmament and International Security* (Oxford University Press: Oxford, 2002), pp. 696–703.

¹²⁸ See Zanders, Hart and Kuhlau (note 127), p. 703.

The distinction between ‘highly refined’ and ‘treated’ spores is often confused. The former implies the removal of vegetative cells (cells that have not sporulated during the spore preparation process) and other debris. Thus, ‘highly refined’ implies a high concentration of spores only, while ‘treated’ implies that a substance has been added to the preparation in order to promote lower viscosity (resistance to flow) and to obtain a median number of spores having a certain diameter that is suitable for achieving deep lung penetration.¹²⁹ In 2006 a researcher at the Hazardous Materials Response Unit laboratory of the US Federal Bureau of Investigation (FBI) published a study on the sampling and analysis procedures used to investigate the attacks that also shed light on the above points. It includes a description of the challenges of integrating law enforcement and scientific and technical requirements when responding to bio-terrorism. According to the study, the understanding that the attacks involved sophisticated spore preparation is a ‘widely circulated misconception’ that is ‘usually the basis for implying that the powders were inordinately dangerous compared to spores alone’ and ‘fosters erroneous misconceptions, which may misguide research and preparedness efforts and generally detract from the magnitude of hazards posed by simple spore preparations’.¹³⁰

US developments in biological warfare prevention and defence

In December 2006 President Bush signed into law the Pandemic and All-Hazards Preparedness Act, which established the Biomedical Advanced Research and Development Authority (BARDA).¹³¹ This authority is designed to identify vulnerabilities in existing medical and public health defences against chemical, biological, radiological and nuclear threats and to facilitate the development of countermeasures, including new medicines. BARDA will be part of the US Department of Health and Human Services, but its effect on existing drug R&D is unclear. Some of the information that BARDA possesses will be exempt from disclosure for at least five years.

This has been pointed to as an example of the lack of transparency in bio-defence activities, which creates concern that bio-defence and bio-terrorism preparedness programmes in some countries might serve as a general cover for an offensive BW capability.¹³² In most countries there is also

¹²⁹ The size would be generally 1–5 microns in diameter (the optimal size for deep lung penetration through the alveolar sacs).

¹³⁰ Beecher, D. J., ‘Forensic application of microbiological culture analysis to identify mail intentionally contaminated with *Bacillus anthracis* spores’, *Applied and Environmental Microbiology*, vol. 72, no. 8 (Aug. 2006), pp. 5304–10.

¹³¹ The White House, ‘President Signs H.R. 5466, H.R. 6143, S. 843, and S. 3678 [the Pandemic and All-Hazards Preparedness Act]’, News release, Washington, DC, 19 Dec. 2006, URL <<http://www.whitehouse.gov/news/releases/2006/12/20061219-2.html>>.

¹³² Miller, J. D., ‘New U.S. biodefense agency signed into law’, *The Scientist*, 11 Jan. 2007, URL <<http://www.the-scientist.com/news/home/40755/>>; and Roffey, R., Hart, J. and Kuhlau, F., ‘Crucial guidance: a code of conduct for biodefense scientists’, *Arms Control Today*, vol. 36, no. 7 (Sep. 2006), pp. 17–20.

a lack of information about the size of such programmes. Funding of BW prevention and defence programmes in the USA, for which there is generally more information, has been estimated at \$7905 million in 2006, and \$8017 million has been requested for 2007. The cumulative funding for 2001–2007 is estimated to be \$44 064 million.¹³³

VII. Conclusions

The effectiveness of the annual meetings of the BTWC parties in 2007–10 will depend in part on whether they can agree measures and reach understandings that promote positive political or practical results. Such results are less likely if the meetings consist only of exchanges of views and information. The actions that states take will be affected by the extent to which the meetings are able to enhance national implementation of the BTWC's provisions and raise the level of political attention and importance attached to various preventive bio-security activities.

As CW stockpiles are further reduced, increased attention will focus on the overall purpose of the CWC and balancing convention activities, such as the extent to which efforts should concentrate on the verification of non-production of chemical weapons by the chemical industry and the implementation of scientific and technological assistance programmes.¹³⁴ The political willingness of the CW possessor states to accept visits may also be tested.

It is increasingly recognized that achieving universal adherence to the BTWC and the CWC and effectively implementing their provisions will substantially reduce the risk of CBW proliferation and terrorism. The fundamental CBW policy challenge remains how to define the threat posed by such weapons (both generally and in terms of specific cases) and what combination of national and international measures should be taken to best address the associated threats. A proper appreciation of the threats posed by CBW requires an interdisciplinary approach that encompasses historical, legal, political and technical factors. However, authoritative public information is lacking to enable assessment of the accusations that state and non-state actors wish to acquire, develop or use such weapons and possess the necessary expertise. The development of effective policies to implement threat assessments and risk-remediation strategies is not always well understood. The current increased focus on bio-safety and bio-security, national implementation of agreements, and outreach and awareness raising among the various scientific and technical communities (e.g. through codes of conduct) has highlighted a continued need to take practical and sustained measures in order to fulfil political commitments.

¹³³ Center for Arms Control and Non-Proliferation, 'Federal funding for biological weapons prevention and defense, fiscal years 2001 to 2007', Washington, DC, 21 June 2006, URL <<http://www.armscontrolcenter.org/archives/002259.php>>, p. 1.

¹³⁴ See e.g. Thakur, R. and Haru, E. (eds), *The Chemical Weapons Convention: Implementation Challenges and Opportunities* (United Nations University Press: New York, N.Y., 2006).

