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NOTE BY THE DIRECTOR-GENERAL

**RESPONSE TO THE REPORT OF THE TWENTY-SIXTH SESSION
OF THE SCIENTIFIC ADVISORY BOARD**

1. This Note presents the Director-General's comments on the report of the Twenty-Sixth Session of the Scientific Advisory Board (SAB) (SAB-26/1, dated 20 October 2017)¹ and the ongoing work of the SAB.
2. Understanding the impact of scientific and technological evolution is a key aspect of the full and effective implementation of the Chemical Weapons Convention (hereinafter "the Convention"). Given current security concerns and the rapid pace of technological change, the need for scientific expertise and literacy in chemical disarmament has never been greater. Effectively preventing the re-emergence of chemical weapons and ensuring that the OPCW remains a fit-for-purpose organisation both benefit from innovation, looking at technological change as an opportunity to enhance capabilities, and a strong science-policy maker partnership. In this regard, the SAB serves as a valuable resource to bring sound scientific advice into decision making.
3. The activities and outputs of the SAB have risen significantly as the Board works towards developing recommendations to the Fourth Special Session of the Conference of the States Parties to Review the Operation of the Chemical Weapons Convention (hereinafter "the Fourth Review Conference"). Over the past two years alone, the Board has produced 11 reports and held eight meetings. This increased workload has substantially reduced the SAB trust fund. The Director-General encourages States Parties to carefully consider the call for voluntary contributions to support the work of the SAB, issued in January this year (S/1569/2018, dated 16 January 2018).
4. Furthermore, the Director-General would like to remind States Parties that four members of the SAB will be leaving the Board in 2018; a formal call for nominations has been issued (S/1568/2018, dated 16 January 2018), with a deadline for submissions of 31 August 2018.

¹ See also the Corrigendum to the Report of the Scientific Advisory Board at its Twenty-Sixth Session (SAB-26/1/Corr.1, dated 18 December 2017).



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5. The SAB met in The Hague, the Netherlands, for its Twenty-Sixth Session from 16 to 20 October 2017. The session was chaired by Dr Christopher Timperley, with Mr Cheng Tang as the Vice-Chairperson. The report of the session was issued as SAB-26/1.
6. In his opening remarks (paragraphs 5.1 to 5.5 of SAB-26/1),² the Director-General highlighted recent milestones in the implementation of the Convention and reflected on challenges it is facing. He stressed that, in response to these challenges, reliable scientific and technical results are vital to verification, and that findings must stand on their technical merit and be objective, accurate, and incontrovertible. The Director-General thanked the Board for its guidance and support in maintaining high levels of scientific integrity through the provision of independent advice, encouraging the Board to be forward thinking, innovative, and bold in the drafting of its report to the Fourth Review Conference. The Director-General maintains that scientific advice strengthens the policy-making process through ensuring that decision makers are well informed about key technical issues. He further emphasised that to benefit from technical advice, science-policy maker engagement must be actively facilitated.
7. The Director-General encourages all States Parties to attend briefings by, and engage in discussion with, the SAB Chairperson and Vice-Chairperson, as well as to participate in Science for Diplomats side events.³ In 2017, the SAB briefed States Parties at the January meeting of the Open-Ended Working Group on the Future Priorities of the OPCW,⁴ at the SAB's Twenty-Fifth (30 March 2017)⁵ and Twenty-Sixth (19 October 2017)⁶ Sessions, and during the Twenty-Second Session of the Conference of the States Parties (hereinafter "the Conference").⁷ The SAB Chairperson will next brief States Parties in the margins of the Twenty-Seventh Session of the SAB, on 22 March 2018.
8. After a careful review of the report of the Twenty-Sixth Session of the SAB, the Director-General is pleased to submit to the Executive Council the comments below.

² Opening remarks by the Director-General at SAB-26 are available at:
www.opcw.org/fileadmin/OPCW/ODG/uzumcu/DG_Remarks_SAB_161017.pdf.

³ More information about and materials from Science for Diplomats briefings are available at:
www.opcw.org/special-sections/science-technology/science-for-diplomats/.

⁴ The presentation from this briefing is available at:
www.opcw.org/fileadmin/OPCW/SAB/en/20170131_SAB_Briefing_to_Open_Ended_Working_Group_Future_Priorities.pdf.

⁵ The presentation from this briefing is available at:
www.opcw.org/fileadmin/OPCW/SAB/en/SAB-25_Chair_Briefing_to_States_Parties.pdf.

⁶ The presentation from this briefing is available at:
www.opcw.org/fileadmin/OPCW/SAB/en/SAB26_Chair_Briefing_to_States_Parties.pdf.

⁷ The statement and accompanying slides are available at:
www.opcw.org/fileadmin/OPCW/SAB/en/SAB_Chair_Remarks_to_CSP22-As_Delivered_2.pdf (statement) and www.opcw.org/fileadmin/OPCW/SAB/en/SAB_Chair_Slides_for_CSP22.pdf (slides).

Recommendations to the Director-General (paragraph 1.2 of SAB-26/1)

9. The Director-General thanks the SAB for the recommendations that have come forth through its intensive scientific review programme. He recognises that the relevance of the recommendations put forward at the SAB's Twenty-Sixth Session is to inspire the collection, consideration, and discussion of inputs for the Fourth Review Conference and to be adequately holistic in informing the States Parties and Technical Secretariat (hereinafter "the Secretariat") alike. Furthermore, he notes that the SAB, while addressing scientific and technological dimensions and issues, has identified practices and approaches that may also be conceptually relevant in non-technical fora and discussions.
10. The Director-General encourages those preparing for the Fourth Review Conference to consider the advice contained in paragraph 1.2 of SAB-26/1 and where similar approaches in gathering information for the formulation of inputs and supporting statements for deliberations would be beneficial. In this regard, the recommendations of subparagraphs 1.2(a) and 1.2(b) are of particular relevance, emphasising the transdisciplinary nature of technology development, as well as the need to engage with a diversity of stakeholders and, especially, to understand where current scientific and technology trends are expected to produce changes in relevant sectors (e.g. industry) in the years immediately following the Fourth Review Conference.
11. In response to subparagraph 1.2(c) of SAB/26-1, recommending engaging operational staff from the Secretariat in fora in which proposals and advice are drafted and considered, the Director-General encourages the facilitators of Fourth Review Conference-relevant advisory bodies and workshops to recognise where such opportunities could be valuable. See also paragraph 13 below for views on the benefits arising from such engagement.
12. In response to subparagraph 1.2(d) of SAB/26-1, recommending more active engagement with technology developers and innovation communities, as well as the consideration of outreach strategies (such as crowdsourcing challenges) to help facilitate these interactions, the Director-General notes that this would benefit from internal discussions to identify capability needs and match those needs to suitable technologies for operational testing. He further notes that innovative engagement strategies such as crowdsource challenges are being discussed in the context of science and technology assessments (see paragraphs 20 to 22 and 28 below).

Updates from the Technical Secretariat (paragraphs 6.1 to 6.18, 8.7 to 8.9, 9.1 to 9.8, 12.1, and 12.2 of SAB-26/1)

13. Given the complexity and nuance required to effectively apply scientific methods and knowledge at an operational level, an understanding of the needs and practices of the Secretariat is necessary for developing practical, timely, and actionable scientific advice. The Director-General views updates provided by the Secretariat to the SAB as a means to provide the Board with deeper insights to consider in developing its advice. Discourse with members of the Secretariat provides feedback to the Board and is valuable for those units involved in technical issues and/or engagement with science-and-technology-relevant stakeholders. The Director-General further notes that such discourse has far-reaching value when the work includes technical dimensions

not generally addressed in the typical thematic fora in which it is discussed. The Director-General has encouraged units within the Secretariat that stand to benefit from interaction with the SAB to liaise with the SAB Secretary in finding suitable opportunities to address the Board.

Advice on chemicals (paragraphs 7.1 to 7.13 of SAB-26/1)

14. Understanding of, and having access to, information on properties, applications, production methods, reactivity, environmental fate, and decontamination of chemicals found both within and outside the schedules of the Convention represent a fundamental capability which the Secretariat must maintain. The Director-General commends the SAB for its diligence in including this topic in its work. He recognises that the task is complicated by research and development that generates scientific knowledge on thousands of new chemicals each day, and appreciates the fact that the SAB is able to identify where this information is of relevance to the Convention, in particular for scheduled chemicals, their impurities, and degradation products, and for unscheduled toxic industrial chemicals such as chlorine.
15. As the SAB has indicated, there is much information within the published scientific literature and in technical documents from relevant industrial and health and safety communities. This includes the reactivity of a variety of commonly available industrial chemicals with materials and vegetation, as well as indicators of human and animal exposure (some information dating back to publications from the mid-twentieth century and earlier). The Director-General encourages the collation and sharing of such information on relevant chemicals amongst technical experts. Accessible data and chemical knowledge strengthen the ability to recognise and analyse signatures unique to chemical exposures and could be informative for assistance and/or fact-finding-related activities involving toxic chemicals with little or no historical examples of use in a chemical weapons-related context.

Chemical production (paragraphs 7.9 to 7.13 and 8.1 to 8.9 of SAB-26/1)

16. As the global chemical industry contributes to world-wide economic growth, the technological developments and chemical products that result manifest themselves in continual change. The Director-General has placed great importance on staying abreast of trends and developments in the chemical industry, and commends the SAB for its engagement with the industrial sector, especially for bringing into consideration aspects of the driving forces that shape change in industry.
17. The Director-General acknowledges that the chemical industry is subjected to a number of national audits and has developed programmes for self-regulation, such as Responsible Care[®]; he also recognises that there is a need for vigilance in the face of change. In this regard, the Director-General encourages States Parties to undertake a thorough review of the report of the SAB's workshop on trends in chemical production,⁸ which was held from 3 to 5 October in Zagreb, Croatia (SAB-26/WP.2, dated 19 October 2017; and paragraphs 8.1 to 8.6 of SAB-26/1). This report looks at trends and the directions they have taken over the course of the 20 years since entry

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See OPCW news item: www.opcw.org/news/article/opcw-scientific-advisory-board-reviews-technological-developments-and-trends-in-chemical-production/.

into force of the Convention, drivers of change in industry, and how these driving forces impact different industrial sectors in their own unique ways. It also provides insight into technological changes being adopted and developed with potential intersection to the implementation of the Convention. The Director-General wishes to thank the Institute for Medical Research and Occupational Health; the Ministry of Economy, Entrepreneurship and Crafts; and the City of Zagreb, which co-organised the workshop under the auspices of the Croatian President, Kolinda Grabar-Kitarović; and the European Union for providing funding to hold the event.⁹ Additionally, the Director-General wishes to thank the SAB Vice-Chairperson for discussing the workshop report with States Parties in the margins of the Twenty-Second Session of the Conference.¹⁰ Findings from the Zagreb workshop will inform the development of the SAB's advice to the Fourth Review Conference.

18. The Director-General notes that the SAB has continued to advise that any process designed for the formation of a chemical substance should be covered by the term "produced by synthesis". With consultations on this issue ongoing within the Industry Cluster, the Director-General encourages States Parties to consider the results of the survey that has been conducted on biomediated processes (S/1534/2017, dated 14 September 2017) as well as the SAB's suggestion that risk assessments to determine the relevance of a given type of production facility to the intent and purpose of the Convention might be an approach to consider in resolving some of the open questions (subparagraph 8.9(b) of SAB-26/1).

Scientific and technological elements of verification technologies, emerging technologies, new equipment, and developments in science and technology (paragraphs 9.1 to 9.16 and 10.1 to 10.8 of SAB-26/1)

19. The review of verification-relevant science and technology constitutes one of the most important elements in the work of the SAB, and provides inputs for the development of new, and enhancement of existing, capabilities available to the Secretariat. With reference to paragraph 13 above, the Director-General views this topical area as one of critical importance for the engagement of the Secretariat with the SAB (paragraphs 9.1 to 9.8 of SAB-26/1). Furthermore, the Director-General recognises that deeper engagement in this area could constitute useful support for the upgrade of the OPCW Laboratory into a Centre for Chemistry and Technology (S/1512/2017, dated 10 July 2017).
20. The Director-General recognises the need to find opportunities arising from scientific progress to improve verification and protection measures. New scientific methods and

⁹ This funding was provided through Project III (Science and Technology: Assessment of Developments in Science and Technology) of European Union Council Decision (CFSP) 2015/259, dated 17 February 2015.

¹⁰ http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2015.043.01.0014.01.ENG.

This presentation is available at: www.opcw.org/fileadmin/OPCW/Science_Technology/Diplomats_Programme/20171129_CTang_Science_Diplomats_Trends_Chem_Production-Presentation.pdf. There is also an introductory presentation from the Secretariat available for the briefing: www.opcw.org/fileadmin/OPCW/Science_Technology/Diplomats_Programme/20171129_Science_Diplomats_Trends_Chem_Production-Intro.pdf.

procedures that have the potential to improve capabilities in sample collection and analysis are especially valuable. In this regard, the Director-General commends the SAB for the organisation of a highly transdisciplinary workshop on emerging technologies¹¹ in Rio de Janeiro, held from 3 to 5 July 2017 (paragraphs 9.9 to 9.14 of SAB-26/1). This workshop brought together experts developing technologies with capabilities to recognise chemical change through a variety of remote-sensing technologies and platforms; this included the potential for the use of vegetation and the monitoring of non-invasive health indicators as real-time sensors of chemical release and exposure. The Director-General encourages States Parties to have their scientific experts review the workshop report (SAB-26/WP.1, dated 21 July 2017) and to consider both the findings and how engagement with innovation communities can benefit disarmament. The Director-General wishes to thank the International Union of Pure and Applied Chemistry (IUPAC); the National Academies of Sciences, Engineering, and Medicine of the United States of America; the Brazilian Academy of Sciences; and the Brazilian Chemical Society for co-organising the workshop; and the European Union for providing funding. Additionally, the Director-General wishes to thank the SAB Chairperson for discussing the workshop report with States Parties in the margins of the Eighty-Sixth Session of the Council.¹² Findings from the Rio de Janeiro workshop will inform the development of the SAB's advice to the Fourth Review Conference.

21. The SAB has noted the extensive use of data analytics (including artificial intelligence-based tools) in enabling new capabilities for emerging technologies. Such tools are expected to become increasingly powerful for applications such as recognising signatures of chemical change and in providing immediate access to pertinent information contained within the continually increasing volume of knowledge related to toxic chemicals. The Director-General encourages the SAB to consider capabilities provided through such tools as a priority in its watching brief on verification-relevant technologies. He looks forward to the SAB's advice indicating areas in which the Secretariat might find uses (paragraphs 9.7, 9.8, 9.15, and 9.16 of SAB-26/1).
22. The Director-General notes that the value of any new technology comes from the capabilities it enables or improves upon, and that such capabilities must be demonstrated under relevant conditions. In this regard, he appreciates the SAB's willingness to facilitate engagement with innovation communities and to keep the Secretariat informed of relevant and potentially fieldable scientific advances (paragraphs 10.1 to 10.8 of SAB/26-1). The Director-General encourages discussion and sharing of experiences with verification-relevant technologies amongst technical experts as a means of recognising opportunities. Needs and requirements identified within the operational units of the Secretariat would provide further guidance.

¹¹ See OPCW news item: www.opcw.org/news/article/scientists-review-innovative-technologies-for-chemical-security/.

¹² This presentation is available at: www.opcw.org/fileadmin/OPCW/Science_Technology/Diplomats_Programme/20171010_Science_Diplomats_Emerging_Tech_Presentation.pdf. There is also an introductory presentation from the Secretariat available for the briefing: www.opcw.org/fileadmin/OPCW/Science_Technology/Diplomats_Programme/20171010_Science_Diplomats_Emerging_Tech-Introduction.pdf.

Advice on chemical forensics and investigative technologies (paragraphs 11.1 to 11.11 of SAB-26/1)

23. The membership of the temporary working group (TWG) on investigative science and technology¹³ has been appointed and its first meeting is scheduled for February 2018. This TWG was established to conduct an in-depth review of the methods and technologies applicable to the investigative work of the Secretariat, especially contingency operations. The Director-General is pleased to see the effort the SAB has put into the preparations for the first meeting (paragraphs 11.1 to 11.3 of SAB-26/1), noting that the Board is already establishing connections with relevant technical experts and communities (paragraphs 11.4 to 11.9 of SAB-26/1), as well as gathering information on methods and techniques useful in investigations and retrospective analysis. The Director-General looks forward to reviewing the deliberations of the TWG. The SAB Chairperson will provide updates from the February meeting when he briefs States Parties in March 2018.

FUTURE WORK AND OTHER BUSINESS OF THE SCIENTIFIC ADVISORY BOARD

24. In 2018, the SAB will hold its Twenty-Seventh Session (from 19 to 23 March), as well as two meetings of the TWG on investigative science and technology. The TWG, will hold its first meeting from 12 to 14 February 2018 and will meet again in the autumn.
25. At its Twenty-Seventh Session, the SAB will focus on completion of the drafting of its report to the Fourth Review Conference. The Director-General commends the Board for its impressive efforts in preparing this report, noting that the transdisciplinary nature of technological change has required the Board to broadly reach out across scientific communities, as well as to capture insights from economic, socio-political, and regulatory influences on scientific development. The SAB has taken inputs from the work of three TWGs, seven regular sessions, five intersessional reports, and four international workshops (organised with funding from the European Union). In total, 25 meetings and workshops were held, 22 of which occurred after the completion of the SAB's report to the Third Review Conference, in the years from 2013 to 2017, with a collective attendance of over 670 participants. The SAB members received over 400 briefings from more than 190 individuals coming from 56 States Parties, and produced 30 reports. The report to the Fourth Review Conference and the subsequent response by the Director-General will be distributed to States Parties in the weeks following the Twenty-Seventh Session of the SAB. The Director-General looks forward to a substantive report, fruitful discussions on the scientific and technological dimensions of the implementation of the Convention, and guidance on scientific trends and issues to consider in the five-year period between the Fourth and Fifth Review Conferences¹⁴.

¹³ The terms of reference for this TWG can be found in Annex 2 of SAB-25/1* (dated 31 March 2017). The questions to be answered by the TWG are available in a quick-reference format at: www.opcw.org/fileadmin/OPCW/SAB/en/TWG_Investigative_Science_Tech_Questions.pdf.

¹⁴ Fifth Review Conference = Fifth Special Session of the Conference of the States Parties to Review the Operation of the Chemical Weapons Convention.

26. The Director-General notes that engagement with the scientific community also plays an important role in gathering inputs for the science and technology review. He commends the SAB for using the review process as an opportunity to broaden the awareness of the Convention and the OPCW across diverse (transdisciplinary) scientific networks. He further recognises that ensuring the capability to stay abreast of technological evolution will require the maintenance and expansion of these connections. Central to keeping a visible and credible presence within the scientific community is participation in scientific conferences and publication in peer-reviewed scientific literature.
27. The Director-General has encouraged the SAB to publish its reports in relevant scientific fora. In this regard, he was pleased to see that the outcomes of the emerging technologies workshop are to be included in a special edition of the IUPAC journal, *Pure and Applied Chemistry* (paragraph 9.11 of SAB-26/1). Furthermore, the Secretariat will continue providing administrative support where possible for the attendance of SAB members at relevant science events. These activities maintain visibility, demonstrate scientific credibility, and serve to strengthen insights into scientific change beyond the review of publications, patents, and other technical materials.
28. Moving ahead, the Director-General looks forward to seeing the approaches the SAB is considering for continuing to monitor scientific advancements and for horizon scanning (paragraph 12.7 of SAB-26/1). As the Board discusses crowdsourcing and technology-based approaches, the Director-General would encourage the Board to share its experiences with, and gain insight from, others who may be using or looking to adopt innovative approaches for stakeholder engagement.
29. The need for sound and actionable technical inputs into the work of the Secretariat will only continue to grow, as will the need for scientific literacy amongst the Convention's decision makers. To this end, the SAB serves as a valuable technical resource, providing science advice and facilitating awareness-raising in technical communities, which further strengthens the role of science in disarmament. The Director-General appreciates the commitment of the SAB members to the implementation of the Convention, as well as the quality and substance of their reports and recommendations, and the Board's willingness to stand ready to provide further technical advice and guidance.

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