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The Biological and Toxin Weapons Convention

Implications of Advances in Science and Technology

Meeting Summary

This report results from research supported by the Naval Postgraduate School's Project on Advanced Systems and Concepts for Countering Weapons of Mass Destruction (PASCC) via Assistance Grant No. N00244-15-1-0039 awarded by the NAVSUP Fleet Logistics Center San Diego to the National Academies of Science (PI: Katherine Bowman). The views expressed in written materials or publications, and/or made by speakers, moderators, and presenters, do not necessarily reflect the official policies of the Naval Postgraduate School nor does mention of trade names, commercial practices, or organizations imply endorsement by the U.S. Government.

The Biological and Toxin Weapons Convention

Considerations for a science
advisory mechanism

Acknowledgments

This project was supported by the United Kingdom Foreign and Commonwealth Office under award from the Strategic Programme Fund to the Royal Society, the Naval Postgraduate School's Project on Advanced Systems and Concepts for Countering Weapons of Mass Destruction (PASCC) via grant N00244-15-1-0039 awarded to the U.S. National Academy of Sciences, and IAP: The Global Network of Science Academies.

This summary is designed as a record of issues that were discussed during the roundtable on science advisory mechanisms held 26 April 2016. The views expressed are those of the authors and do not necessarily represent the consensus opinions of participants at the roundtable or the organizations that provided support for the project, nor does mention of trade names, commercial practices, or organisations imply endorsement by the US or UK governments or other sponsors. Biosecure was commissioned to produce this report.

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Introduction

In April 2016, on behalf of the IAP: Global Network of Science Academies, the UK Royal Society, Polish Academy of Sciences and US National Academy of Sciences convened a roundtable on a Science Advisory Process for the Biological and Toxin Weapons Convention (BTWC).

The event brought together technical experts, science advice practitioners and key stakeholders from 13 countries. It took place on the margins of the April Preparatory Committee meeting (PrepCom) of the 8th Review Conference of the BTWC. It was designed to facilitate ongoing discussions amongst States Parties on strengthening arrangements for reviewing developments in science and technology. Participants explored different options and practical considerations in the specific context of the BTWC.

This roundtable built upon deliberations over science advice processes during the international workshop on Trends in Science and Technology Relevant to the Biological and Toxin Weapons Convention, convened by the IAP: Global Network of Science Academies, the UK Royal Society, the Polish Academy of Sciences and US National Academy of Sciences.¹

To facilitate discussions at this meeting, Biosecure Ltd was commissioned to provide an overview of relevant background material on good practice in addressing science and technology in policy settings, parameters and considerations for reviewing developments relevant to the BTWC, models used in other fora, as well as proposals made prior to the PrepCom for such a mechanism under that treaty.²

The meeting was able to draw on a number of working papers submitted by States Parties to the PrepCom on this issue, including:

- **Strengthening the Biological Weapons Convention Proposal for the establishment of a Scientific Advisory Committee** – Submitted by the Russian Federation (BWC/CONF.VIII/PC.WP.2/Rev.1);
- **Science and technology review for the BWC: Features of an effective process** – Submitted by the United States of America (BWC/CONF.VIII/PC.WP.3);
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- **Elements on science and technology for the 2016 Review Conference** – the importance of an active review process – Submitted by Finland, Norway and Sweden (BWC/CONF.VIII/PC.WP.7); and
- **Strengthening the BWC science and technology review process** – Submitted by Switzerland (BWC/CONF.VIII/PC.WP.8).³

In framing their deliberations, participants were asked to consider a series of practical questions on science advice.

1 <https://royalsociety.org/topics-policy/projects/biological-toxin-weapons-convention/>

2 http://biosecu.re/biosecure/publications_files/Biosecu.re-%20BWC%20S%26T%20Process-BackgroundDoc-160610.pdf

3 <http://www.unog.ch/bwc>

Why?

Why does the BTWC need a scientific advisory process?

When considering the working papers tabled by States Parties on this issue, it was noted that rationales provided included:

- To identify implications for the BTWC, in particular in relation to its scope, that could result in new understandings or agreements, such as the development of capabilities that would be contrary to the aims of the treaty but are not covered by existing language;
- To identify applications of science or technology which could assist States Parties in realising the aims of the BTWC, including by sharing such benefits; and
- To share experience and develop common understandings on how best to identify and oversee activities of potential relevance to the BTWC, such as how best to address Dual Use Research of Concern.

The meeting repeatedly heard of the value in having a dedicated science advisory process to inform and advise States Parties that was able to deal with the rapid pace of development in science. There were also reminders that such a process is not meant to be the sole source of science advice. There will remain an important role for States Parties and the international scientific community in conducting their own reviews and assessments and feeding the results into the work of this treaty.

Why change the existing arrangements?

Some participants noted that the existing arrangements had been useful. Adding a Standing Agenda Item on developments in science and technology into the mandate of the Meeting of Experts had provided an open ended meeting that brought together scientists and diplomats. In practice, these meetings also involved invited experts and national technical advisors, so they were able to access a broad base of expertise.

There was recognition that there had been problems in translating technical discussions into policy process. By integrating the science and technology advisory process into the Meeting of Experts, its efforts were getting lost in general work of the BTWC. It was suggested that this could be corrected by having a separate meeting, with a separate report, that could then be fed back into the policy process.

Other shortcomings of the current arrangements highlighted by participants included:

- The rigidity of setting the topics to be considered in advance for a five-year period;
- A lack of focus or guidance as to how specific sub-topics should be addressed on an ongoing basis throughout the work programme;
- Ensuring timely consideration of rapidly moving advances;
- Too much input from non-specialists and involvement of policy elements;
- Getting invited external experts to focus on the implications for the BTWC of the advances they were presenting;
- Limits on the utility of side events or input from the scientific community due to resource limitations;
- Difficulties in integrating input provided in informal sessions, side events and on the margins of the work programme into the formal work of the BTWC;
- Difficulties in distilling from the formal work of the BTWC specific needs for science advice;
- A lack of interactivity in discussions on science and technology; and
- Not providing answers to specific questions raised by States Parties.

Who?

Who should be involved?

In particular, participants were asked to consider whether provided science advice might be most usefully provided by a single body or through a more informal consultative arrangement. Opportunities for input from the scientific community were also considered.

There was broad agreement among participants that the process would need a well-balanced membership – representing diversity in both geography and technical backgrounds. A list of necessary technical expertise was felt to be a useful resource for future deliberations on a science advisory process. It is unlikely any process would include all the possible expertise it might need to access and therefore participants stressed the importance of being able to access external expertise dependent on the topics being considered. Involving experts from industry was felt to be important. Possible contributions from existing technical networks and expert groups was also discussed. Temporary Working Groups were felt to be useful for expanding opportunities to diversify expertise.

Two models were identified from the working papers submitted to the PrepCom by States Parties. The same two models formed the basis of discussions at the meeting:

- A committee or board comprised of a limited number of technical experts nominated by States Parties, similar to that used to address scientific and technological developments relevant to chemical weapons; or
- An open-ended meeting format where any interested States Party could participate, similar to open ended working groups used in other disarmament processes.

There was no overwhelming agreement amongst participants as to which model was most suitable in the context of the BTWC. There was broad agreement, however, that regardless of the format, it would be important to involve relevant expertise from other international organisations, such as the WHO, FAO and OIE. Opportunities for granting observer status to such organizations, as well as relevant international scientific and industry bodies was also discussed.

There were also discussions as to whether a group was necessary or whether a Scientific Advisor (similar to national Chief Science Advisors) might suffice. Many participants felt that a larger process, drawing on multiple States Parties and their technical experts, might be a better fit in the BTWC context. Alternatively, more comprehensive approaches for determining what expertise was necessary and enabling science advice were considered but felt by many participants to require more resources than may be made available under the BTWC.

Who should govern such a process?

There was broad recognition that a science advisory process must meet the needs of the BTWC and its States Parties. As such, ultimate responsibility for the process would likely rest with States Parties but there was recognition that different roles and responsibilities might be necessary, including:

- **A focal point amongst States Parties to act as a bridge between the technical discussions and the policy work of the BTWC** – such a role could be undertaken by the Chair or Vice-Chairs of annual meetings, or by a dedicated Friend of the Chair, Coordinator, or equivalent appointed for a longer period, perhaps for the duration of the next intersessional process;
- **A Chair to lead the work of the process** – this might be an individual elected from within the group's membership or assigned as a duty for a focal point drawn from States Parties. Such an individual will need to be familiar with technical materials and the culture of more technical processes and seen as a credible lead by those involved in this process; and
- **Some form of institutional support** – to act as a conduit between the technical and policy aspects of the work, provide administrative support and ensure that the process seizes the opportunities with which it is presented. Such individuals would also need to interact with the broader scientific and technological communities, requiring an expanded travel budget. Such a position might not be necessary if suitable skills, experience and resources are present in the other roles.

There was a discussion of a different model where the science advisory process advised the Implementation Support Unit (ISU) rather than States Parties. Given the current size and status of the ISU, and the established need for science advice amongst States Parties, there was broad agreement that such a process should support the work of the members of the treaty rather than its secretariat.

Who should fund it?

There was a broad understanding that if the science advisory process was to serve the needs of the BTWC and its States Parties, that they should be the ones to fund it. There were discussions as to whether this cost should be included in the general budget of the treaty (and therefore split between all States Parties) or based upon voluntary contributions (where costs would be borne by a limited number of States Parties). A combined model was also considered, where the core work of a process would be included in the budget of the treaty and voluntary funding could support additional work, such as the activities of temporary working groups. Regardless of approach, there was broad recognition of the need to provide support to facilitate the participation of experts from low and middle-income countries. This might be administered through the same arrangements as the existing sponsorship programme.

Who should provide administrative support?

The meeting heard in the context of other science advisory processes, such as inside the Organization for the Prohibition of Chemical Weapons and the United Nations Office for Disaster Risk Reduction, of the value added by having a dedicated staff member inside the body that provides institutional support. Such individuals played an important role in helping bridge the gap between science and policy. In other settings a dedicated staff member acts as a day-to-day focal point and helps maintain focus and momentum between meetings of the process. The costs of appointing such an individual were noted, and approximated equivalent to about four days of meeting time including simultaneous interpretation. Some participants suggested that such a role is unnecessary if the process has a suitable Chair or Coordinator from amongst States Parties.

The meeting heard of the challenges of recruiting individuals with such specific skill sets under the current United Nations recruitment arrangements. Several participants felt strongly that the BTWC ISU was owned by States Parties and that their direct intervention would overcome such hurdles. It was also suggested that the use of consultants to provide background information and conduct technical reviews might avoid the need to hire a specialist member for the ISU, offering considerable cost savings.

What?

What should it include?

A mini survey conducted prior to the meeting highlighted the value of the process both identifying relevant developments and considering their implications. As a result, it was suggested that the scientific advisory process would need to survey recent trends, highlight possible risks and benefits for the BTWC (especially in relation to Article I and the scope of the treaty) and make appropriate recommendations to States Parties as to how best they might be respectively mitigated and maximised.

Participants were therefore asked to consider whether the advisory process:

- **Should survey recent developments** – There was broad agreement that this should be an important aspect of the work of any process. A reoccurring theme during the meeting was ensuring that any process was sufficiently flexible to be able to consider new developments as they occur. The need to consider the implications of gene editing technologies was highlighted. Several participants felt that rather than focus on specific advances a process should attempt to identify trends in current research and development. Changes in how research, development, or industrialisation were conducted were highlighted. There was also broad support that such a review would need to address both cutting edges advances in research, as well as more mature technologies that could provide short-term applications relevant to the treaty. It was noted that specific expertise was needed to address each of these two aspects. The Science and Technology Advisory Group of the United Nations Office for Disaster Risk Reduction convened a specific horizon scanning working group, for example. Relevant experts may also need to be drawn from different communities with a greater focus on academia in the former and a heavier involvement of industry in the latter. There was also a discussion as how input for such a review might be obtained. Different models were considered including the role of institutional support, contributions from the scientific community, and the use of consultants;
- **Should produce recommendations** – As there was broad support for a science advisory process also considering the implications of surveyed advances, there is a need to suggest ways those implications might be addressed. The advice provided can only be as good as the questions being asked – making it important that the tasks being allotted to the process are conducive to a technical answer. Participants noted that it was important to keep the possible implications grounded in technical realities and to avoid addressing very hypothetical risks. The cost implications of requesting experts, either inside or outside of governments, to consider implications outside of their regular duties was noted. The importance of identifying gaps in current research was also noted, as was the utility of using the advisory process to develop research agendas to fill those gaps;
- **Should make predictions or warnings** – Several participants recognised the importance of the process identifying key steps in ongoing development of new developments and technologies that might cause a distinct change in the risk environment by opening the door to applications of direct relevance to the aims of the BTWC; and/or
- **Should conduct risk and benefit assessments** The challenges of conducting an effective risk and benefit assessment of emerging trends were noted, including the importance of considering the factors driving development, such as understanding who was financing work and why, and how that impacts the applications that can be readily realised (as well as those less likely to be achievable). Other participants noted that the risks of relevant developments were well understood.

Current shortcomings in relevant toolsets were noted. Participants recognised the value of the process being used to develop guidance and tools, for example, on appropriate national oversight regimes or conducting risk and benefit analyses. Discussions on guidance noted that this should not be a one-size-fits-all approach. Whilst harmonization between approaches was important, there will be a need to tailor them to national, facility or political contexts. Active participation in the development process also provides important awareness raising and engagement opportunities.

What format should it adopt?

Participants were asked to consider whether the work of the science advisory process should be structured so as to address the various articles of the BTWC, by theme or scientific discipline, or to answer specific questions. Several Participants noted the importance of having a well structured arrangement with a clear mandate. There was also broad agreement that it would not be feasible or desirable to attempt to review all potentially relevant developments every year. A way to focus the review was needed. Some participants felt that an annual topic or theme might be useful. Others felt that the process might usefully focus on specific questions asked by States Parties or the annual Chair of BTWC meetings.

There was broad recognition that the format of the science advisory process will depend upon decisions to be taken by States Parties on the shape and content of any future intersessional work programme. It was suggested that the format of the science advisory process should be fitted to the broader work programme, providing input into the policy discussions, as appropriate, and exploring and addressing identified needs of States Parties. This might be a dynamic process requiring ongoing refinement during the work programme.

For what audience should the output be written?

The decision as to whether the process' output is termed in technical or non-specialist language will determine its accessibility and utility to different audiences. Participants considered the relative strengths and weaknesses of each approach. A mini survey conducted prior to the meeting highlighted the value of producing different outputs for different audiences, for example, specialist outputs for technical experts and non-specialist outputs for policy-makers and diplomats. In this regard, the need for effective science communication was noted, including the need for people who are able to 'translate' between science and policy. It will be necessary for the process to be able to communicate how the science impacts the work of non-specialists, such as diplomats. The importance of linking the process to the work programme of the BTWC was repeatedly stressed during the meeting.

The relationship between technical advice and the policy processes into which they were fed was also explored in some depth. Some participants noted that repeated and prolonged technical discussions can be a tool used to prolong or put off political decision making. The importance of a science advisory process focusing on technical issues was highlighted. There were strong views that such a process should not go beyond technical issues and become involved in policy issues. Participants also highlighted that technical input is only one of the elements that shapes a policy decision and that technical assessments might need to be reviewed from different perspectives, such as broader ethical or regulatory viewpoints.

How?

How should the output of the process be structured?

Participants considered whether the advisory process should produce a report or whether other forms of output might also be useful. There was broad agreement that each meeting of the process should have a report which would be transmitted to States Parties. Participants felt that every time the process met there should also be a briefing for States Parties that describes the work being undertaken and what was discussed. This would help raise the profile of the science advisory process amongst policy-makers.

How will views and opinions be sought or responded to?

How the process might be tasked with examining specific issues was discussed at length. There was little support for establishing a definitive programme for the next intersessional work period at the review conference itself. A more flexible approach was needed. Opportunities to set topics, questions, or themes for the following year at annual meetings, such as a Meeting of States Parties were considered. As were empowering the Chair or any Executive Committee or Bureau to add elements to the work of the science advisory process. A responsive mechanism was needed, allowing the work of the process to adapt in response to real world development. For example, it was felt to be important that insights into issues and advances that are appearing in the media could be provided. This might result in greater public or policy-maker interest in security implications of contemporary issues, as well as the work of the BTWC more broadly. It was suggested that the mandate of the process might usefully include an agenda item that would enable participants to raise new issues or advances of which they have become aware.

How could success be measured?

Several participants highlighted the lack of interactivity and the minimal engagement as weaknesses in current arrangements to address developments in science and technology. Other participants felt that such metrics did not reflect broader impacts from passive participation. Anecdotal evidence was discussed as to the benefits of awareness raising and education of passive participation.

The importance of measuring output as well as input was noted. There were opportunities to attempt to capture what States Parties had done, collectively or individually, as a result of the work of the science advisory process. This would likely involve abstracting information provided during other meetings of the BTWC, such as national statements and updates made during a Meeting of States Parties.

A third measure was felt to be the degree of satisfaction amongst States Parties. A science advisory process would be a success if States Parties felt it was useful and assisting them in their work. It was pointed out that such a process would not be the property of individual States Parties but of the membership of the BTWC as a whole, suggesting that the collective satisfaction with a process would be a better measure of success.

When?

When should the advisory group meet and how often?

Participants were asked to consider whether the science advisory process should meet on a regular basis, upon request, or when triggered by some other element. There was broad agreement that conducting such reviews every five years at review conferences was too infrequent and that more regular, more tightly focused annual reviews would be useful. Participants also highlighted that different types of activity might be needed with different frequency or time frames. Overarching trend reviews might be needed less frequently. Answers to specific questions or addressing specific topics might be achieved with a fixed time frame set in advance. Responding to real world developments, might necessitate immediate action and prompt consideration.

Whilst participants argued that the amount of time a process would need to meet would be dependent upon the tasks it is allotted and the rate and scale of the developments covered, there was also broad recognition that practical considerations, such as cost, will limit the time available. It was unclear which factor would likely have a greater impact on decisions as to how often and for how long the process might meet.

There was broad support for making most effective use of meeting time as possible, including through thorough preparation. There was also a discussion over the use of remote working and audio/visual conferencing tools to increase the amount of time that could be spent addressing these issues with a minimum cost implication. Several participants pointed out that such tools are still unavailable or unreliable in many parts of the world.

When during the BTWC cycle should this occur?

It was suggested that the science advisory process should meet prior to other work undertaken by States Parties, allowing its output to be fed in to, and influence their discussions. Other participants suggested that it might meet in parallel to other BTWC meetings, such as the Meeting of Experts, to minimize the logistical burdens on participants.

Where?

Where should the advisory process be based or meet?

There may be advantages to holding meetings of the process in Geneva before or in parallel with other meetings of the BTWC. The ISU is also based in Geneva simplifying the provision of administrative support. The high costs of holding meetings in Geneva was noted.

Participants discussed the possibility of rotating meetings of the process throughout different regions. One model would be to move the meeting through the large United Nations conference once per intersessional work programme: with annual meetings in Geneva, Bangkok, Nairobi and New York. This would enable experts from each region to participate without the need for intercontinental travel at least once per cycle. This should increase the range and type of expertise available to the process. It should also offer significant cost savings, given the comparative meeting costs between these centres (noting that there will be new costs involved with moving core administrative support to new locations). Several participants felt such a model could help foster greater buy in for the treaty around the world.

How do the models for a scientific advisory process currently under discussion for the BTWC address these questions?

During the final session of the meeting, participants worked in small groups to consider the proposals contained in the working papers submitted to the PrepCom in light of the above questions. Summaries provided by the rapporteurs provided an overview of the discussions.

Working group A

The group felt that a science advisory process should promote awareness and buy-in and be simple, flexible, visible and have ownership by States Parties. The process could usefully: assist in providing an overview of trends in science and technology to facilitate the work of review conferences; address specific questions of interest to States Parties; provide distilled summaries for policy makers; and conduct outreach or briefings on its findings.

For any topic examined through such a process, the group suggested considering an overview of the development, its possible impacts, actions that could be taken, and the consequences of not taking action. When determining the format of the process, the group stressed the importance of addressing diversity of scientific expertise, geographic diversity, and sponsorship for participation of experts from developing countries.

Identifying the topics that a science advisory process would address should be a two-way process. It will be necessary to draw upon both the priorities of States Parties and the views of scientists involved in emerging fields of science and technology that could have implications for the BTWC. The group also noted that national working papers can play a role in flagging possible issues to be considered by a process.

On the output of the process, the group also noted importance of recording both where there is consensus among experts as well as where there are disagreements or differences of opinion on the issues being considered. There was recognition of the need to have arrangements in place to feed the output from such a process into the broader work of the BTWC.

The group also discussed the advantages and disadvantages of different approaches. An advisory committee or board provides consistency and a more nuanced understanding of the policy framework in which the advisory process is working but will need to work to expand the range of available expertise given the scale and scope of topics which could become relevant. A more open-ended approach would help expand the range of expertise on which the process might draw but might be harder to focus on specific tasks. Either way, the group stressed the importance of having a consistent support that can help maintain momentum, assist in preparing the reports, and understand the science/policy and BTWC interfaces. The group also raised the possibility of developing more concrete costings for the models under discussion and perhaps compare them to the costs for parallel activities in other processes.

Working group B

The group spent a good deal of time reviewing the details of the different proposals for a science advisory mechanism. The group found that regardless of the model, it would be important to separate the process from other BTWC meetings. Such meetings can provide important opportunities to interface with policy discussions. The Meeting of Experts could be briefed on the efforts of the science advisory process and a formal report could be delivered to the Meeting of States Parties.

The group also noted the impact of having the right Chair on likelihood of success. An individual that could bridge the science policy divide, whilst remaining a credible authority in the eyes of technical experts would facilitate the work of the process. It would also be important that the Chair can commit sufficient time and effort to help drive the process.

The reporting process itself was also considered. Well drafted summaries and executive findings were felt to be particularly important. There was also a discussion as to whether the report should be on behalf of the Chair (as it would be their views, it would not need to be agreed by consensus) or the process (in which case it would need to be developed and agreed by consensus). The former is quicker and simpler but may have less stature. The latter may be more representative but would likely consume valuable meeting time. Developing a policy-focused summary might be simpler for the former but more challenging in the latter, especially to capture the nuances required to reach consensus. The different models for a science advisory process also seemed to impact reporting decisions. This group felt that reaching agreement on a consensus report in an open ended setting would use too much of the time allocated for substantive discussions. The group also noted the importance of recording differences in opinion as well as consensus findings.

The group also discussed what might happen when there are incompatibilities between technical findings and political realities.

When considering how to engage the necessary expertise, there was broad agreement amongst the group that the participation of professional scientific organizations was important. In general, such a process should be inclusive, rather than exclusive. In models where the number of participants is limited, the group discussed the challenges of ensuring appropriate representation across expertise and geographic distribution. There was broad agreement that membership should be based primarily on technical expertise. The group also considered the cost implications of each of the two models. In a committee or board, costs to subsidize the participation of experts would likely be centralized and split across the treaty's full membership. For an open ended working group such sponsorship would be more likely be financed through the use of voluntary funds, presumably placing the burden on a much more limited number of states.

The institutional support requirements of the two proposed models were considered. In general, this was felt to be roughly equal regardless of the model chosen. There was broad agreement that additional support would be needed. Such support could be provided either by dedicated staff for the ISU or through the use of consultants. Either way, the group felt that the ISU would likely need additional resources to support outreach and engagement with scientific and technical communities, including an increased travel budget.

As a concrete next step, this group recommended bringing together all those that have proposed models or engaged with the development of a science advisory process for an exchange of views. Despite differences in approach there seemed to be an emerging consensus among BTWC States Parties that such a process is needed. It was important to build upon these shared priorities. Whilst additional informal meetings were felt to have some utility, members of this group felt that it was necessary to start moving towards more formal discussions.

Acknowledgments

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Why?

Why does the BTWC need a scientific advisory process?

When considering the working papers tabled by States Parties on this issue, it was noted that rationales provided included:

- To identify implications for the BTWC, in particular in relation to its scope, that could result in new understandings or agreements, such as the development of capabilities that would be contrary to the aims of the treaty but are not covered by existing language;
- To identify applications of science or technology which could assist States Parties in realising the aims of the BTWC, including by sharing such benefits; and
- To share experience and develop common understandings on how best to identify and oversee activities of potential relevance to the BTWC, such as how best to address Dual Use Research of Concern.

The meeting repeatedly heard of the value in having a dedicated science advisory process to inform and advise States Parties that was able to deal with the rapid pace of development in science. There were also reminders that such a process is not meant to be the sole source of science advice. There will remain an important role for States Parties and the international scientific community in conducting their own reviews and assessments and feeding the results into the work of this treaty.

Why change the existing arrangements?

Some participants noted that the existing arrangements had been useful. Adding a Standing Agenda Item on developments in science and technology into the mandate of the Meeting of Experts had provided an open ended meeting that brought together scientists and diplomats. In practice, these meetings also involved invited experts and national technical advisors, so they were able to access a broad base of expertise.

There was recognition that there had been problems in translating technical discussions into policy process. By integrating the science and technology advisory process into the Meeting of Experts, its efforts were getting lost in general work of the BTWC. It was suggested that this could be corrected by having a separate meeting, with a separate report, that could then be fed back into the policy process.

Other shortcomings of the current arrangements highlighted by participants included:

- The rigidity of setting the topics to be considered in advance for a five-year period;
- A lack of focus or guidance as to how specific sub-topics should be addressed on an ongoing basis throughout the work programme;
- Ensuring timely consideration of rapidly moving advances;
- Too much input from non-specialists and involvement of policy elements;
- Getting invited external experts to focus on the implications for the BTWC of the advances they were presenting;
- Limits on the utility of side events or input from the scientific community due to resource limitations;
- Difficulties in integrating input provided in informal sessions, side events and on the margins of the work programme into the formal work of the BTWC;
- Difficulties in distilling from the formal work of the BTWC specific needs for science advice;
- A lack of interactivity in discussions on science and technology; and
- Not providing answers to specific questions raised by States Parties.

Who?

Who should be involved?

In particular, participants were asked to consider whether provided science advice might be most usefully provided by a single body or through a more informal consultative arrangement. Opportunities for input from the scientific community were also considered.

There was broad agreement among participants that the process would need a well-balanced membership – representing diversity in both geography and technical backgrounds. A list of necessary technical expertise was felt to be a useful resource for future deliberations on a science advisory process. It is unlikely any process would include all the possible expertise it might need to access and therefore participants stressed the importance of being able to access external expertise dependent on the topics being considered. Involving experts from industry was felt to be important. Possible contributions from existing technical networks and expert groups was also discussed. Temporary Working Groups were felt to be useful for expanding opportunities to diversify expertise.

Two models were identified from the working papers submitted to the PrepCom by States Parties. The same two models formed the basis of discussions at the meeting:

- A committee or board comprised of a limited number of technical experts nominated by States Parties, similar to that used to address scientific and technological developments relevant to chemical weapons; or
- An open-ended meeting format where any interested States Party could participate, similar to open ended working groups used in other disarmament processes.

There was no overwhelming agreement amongst participants as to which model was most suitable in the context of the BTWC. There was broad agreement, however, that regardless of the format, it would be important to involve relevant expertise from other international organisations, such as the WHO, FAO and OIE. Opportunities for granting observer status to such organizations, as well as relevant international scientific and industry bodies was also discussed.

There were also discussions as to whether a group was necessary or whether a Scientific Advisor (similar to national Chief Science Advisors) might suffice. Many participants felt that a larger process, drawing on multiple States Parties and their technical experts, might be a better fit in the BTWC context. Alternatively, more comprehensive approaches for determining what expertise was necessary and enabling science advice were considered but felt by many participants to require more resources than may be made available under the BTWC.

Who should govern such a process?

There was broad recognition that a science advisory process must meet the needs of the BTWC and its States Parties. As such, ultimate responsibility for the process would likely rest with States Parties but there was recognition that different roles and responsibilities might be necessary, including:

- **A focal point amongst States Parties to act as a bridge between the technical discussions and the policy work of the BTWC** – such a role could be undertaken by the Chair or Vice-Chairs of annual meetings, or by a dedicated Friend of the Chair, Coordinator, or equivalent appointed for a longer period, perhaps for the duration of the next intersessional process;
- **A Chair to lead the work of the process** – this might be an individual elected from within the group's membership or assigned as a duty for a focal point drawn from States Parties. Such an individual will need to be familiar with technical materials and the culture of more technical processes and seen as a credible lead by those involved in this process; and
- **Some form of institutional support** – to act as a conduit between the technical and policy aspects of the work, provide administrative support and ensure that the process seizes the opportunities with which it is presented. Such individuals would also need to interact with the broader scientific and technological communities, requiring an expanded travel budget. Such a position might not be necessary if suitable skills, experience and resources are present in the other roles.

There was a discussion of a different model where the science advisory process advised the Implementation Support Unit (ISU) rather than States Parties. Given the current size and status of the ISU, and the established need for science advice amongst States Parties, there was broad agreement that such a process should support the work of the members of the treaty rather than its secretariat.

Who should fund it?

There was a broad understanding that if the science advisory process was to serve the needs of the BTWC and its States Parties, that they should be the ones to fund it. There were discussions as to whether this cost should be included in the general budget of the treaty (and therefore split between all States Parties) or based upon voluntary contributions (where costs would be borne by a limited number of States Parties). A combined model was also considered, where the core work of a process would be included in the budget of the treaty and voluntary funding could support additional work, such as the activities of temporary working groups. Regardless of approach, there was broad recognition of the need to provide support to facilitate the participation of experts from low and middle-income countries. This might be administered through the same arrangements as the existing sponsorship programme.

Who should provide administrative support?

The meeting heard in the context of other science advisory processes, such as inside the Organization for the Prohibition of Chemical Weapons and the United Nations Office for Disaster Risk Reduction, of the value added by having a dedicated staff member inside the body that provides institutional support. Such individuals played an important role in helping bridge the gap between science and policy. In other settings a dedicated staff member acts as a day-to-day focal point and helps maintain focus and momentum between meetings of the process. The costs of appointing such an individual were noted, and approximated equivalent to about four days of meeting time including simultaneous interpretation. Some participants suggested that such a role is unnecessary if the process has a suitable Chair or Coordinator from amongst States Parties.

The meeting heard of the challenges of recruiting individuals with such specific skill sets under the current United Nations recruitment arrangements. Several participants felt strongly that the BTWC ISU was owned by States Parties and that their direct intervention would overcome such hurdles. It was also suggested that the use of consultants to provide background information and conduct technical reviews might avoid the need to hire a specialist member for the ISU, offering considerable cost savings.

What?

What should it include?

A mini survey conducted prior to the meeting highlighted the value of the process both identifying relevant developments and considering their implications. As a result, it was suggested that the scientific advisory process would need to survey recent trends, highlight possible risks and benefits for the BTWC (especially in relation to Article I and the scope of the treaty) and make appropriate recommendations to States Parties as to how best they might be respectively mitigated and maximised.

Participants were therefore asked to consider whether the advisory process:

- **Should survey recent developments** – There was broad agreement that this should be an important aspect of the work of any process. A reoccurring theme during the meeting was ensuring that any process was sufficiently flexible to be able to consider new developments as they occur. The need to consider the implications of gene editing technologies was highlighted. Several participants felt that rather than focus on specific advances a process should attempt to identify trends in current research and development. Changes in how research, development, or industrialisation were conducted were highlighted. There was also broad support that such a review would need to address both cutting edges advances in research, as well as more mature technologies that could provide short-term applications relevant to the treaty. It was noted that specific expertise was needed to address each of these two aspects. The Science and Technology Advisory Group of the United Nations Office for Disaster Risk Reduction convened a specific horizon scanning working group, for example. Relevant experts may also need to be drawn from different communities with a greater focus on academia in the former and a heavier involvement of industry in the latter. There was also a discussion as how input for such a review might be obtained. Different models were considered including the role of institutional support, contributions from the scientific community, and the use of consultants;
- **Should produce recommendations** – As there was broad support for a science advisory process also considering the implications of surveyed advances, there is a need to suggest ways those implications might be addressed. The advice provided can only be as good as the questions being asked – making it important that the tasks being allotted to the process are conducive to a technical answer. Participants noted that it was important to keep the possible implications grounded in technical realities and to avoid addressing very hypothetical risks. The cost implications of requesting experts, either inside or outside of governments, to consider implications outside of their regular duties was noted. The importance of identifying gaps in current research was also noted, as was the utility of using the advisory process to develop research agendas to fill those gaps;
- **Should make predictions or warnings** – Several participants recognised the importance of the process identifying key steps in ongoing development of new developments and technologies that might cause a distinct change in the risk environment by opening the door to applications of direct relevance to the aims of the BTWC; and/or
- **Should conduct risk and benefit assessments** The challenges of conducting an effective risk and benefit assessment of emerging trends were noted, including the importance of considering the factors driving development, such as understanding who was financing work and why, and how that impacts the applications that can be readily realised (as well as those less likely to be achievable). Other participants noted that the risks of relevant developments were well understood.

Current shortcomings in relevant toolsets were noted. Participants recognised the value of the process being used to develop guidance and tools, for example, on appropriate national oversight regimes or conducting risk and benefit analyses. Discussions on guidance noted that this should not be a one-size-fits-all approach. Whilst harmonization between approaches was important, there will be a need to tailor them to national, facility or political contexts. Active participation in the development process also provides important awareness raising and engagement opportunities.

What format should it adopt?

Participants were asked to consider whether the work of the science advisory process should be structured so as to address the various articles of the BTWC, by theme or scientific discipline, or to answer specific questions. Several Participants noted the importance of having a well structured arrangement with a clear mandate. There was also broad agreement that it would not be feasible or desirable to attempt to review all potentially relevant developments every year. A way to focus the review was needed. Some participants felt that an annual topic or theme might be useful. Others felt that the process might usefully focus on specific questions asked by States Parties or the annual Chair of BTWC meetings.

There was broad recognition that the format of the science advisory process will depend upon decisions to be taken by States Parties on the shape and content of any future intersessional work programme. It was suggested that the format of the science advisory process should be fitted to the broader work programme, providing input into the policy discussions, as appropriate, and exploring and addressing identified needs of States Parties. This might be a dynamic process requiring ongoing refinement during the work programme.

For what audience should the output be written?

The decision as to whether the process' output is termed in technical or non-specialist language will determine its accessibility and utility to different audiences. Participants considered the relative strengths and weaknesses of each approach. A mini survey conducted prior to the meeting highlighted the value of producing different outputs for different audiences, for example, specialist outputs for technical experts and non-specialist outputs for policy-makers and diplomats. In this regard, the need for effective science communication was noted, including the need for people who are able to 'translate' between science and policy. It will be necessary for the process to be able to communicate how the science impacts the work of non-specialists, such as diplomats. The importance of linking the process to the work programme of the BTWC was repeatedly stressed during the meeting.

The relationship between technical advice and the policy processes into which they were fed was also explored in some depth. Some participants noted that repeated and prolonged technical discussions can be a tool used to prolong or put off political decision making. The importance of a science advisory process focusing on technical issues was highlighted. There were strong views that such a process should not go beyond technical issues and become involved in policy issues. Participants also highlighted that technical input is only one of the elements that shapes a policy decision and that technical assessments might need to be reviewed from different perspectives, such as broader ethical or regulatory viewpoints.

How?

How should the output of the process be structured?

Participants considered whether the advisory process should produce a report or whether other forms of output might also be useful. There was broad agreement that each meeting of the process should have a report which would be transmitted to States Parties. Participants felt that every time the process met there should also be a briefing for States Parties that describes the work being undertaken and what was discussed. This would help raise the profile of the science advisory process amongst policy-makers.

How will views and opinions be sought or responded to?

How the process might be tasked with examining specific issues was discussed at length. There was little support for establishing a definitive programme for the next intersessional work period at the review conference itself. A more flexible approach was needed. Opportunities to set topics, questions, or themes for the following year at annual meetings, such as a Meeting of States Parties were considered. As were empowering the Chair or any Executive Committee or Bureau to add elements to the work of the science advisory process. A responsive mechanism was needed, allowing the work of the process to adapt in response to real world development. For example, it was felt to be important that insights into issues and advances that are appearing in the media could be provided. This might result in greater public or policy-maker interest in security implications of contemporary issues, as well as the work of the BTWC more broadly. It was suggested that the mandate of the process might usefully include an agenda item that would enable participants to raise new issues or advances of which they have become aware.

How could success be measured?

Several participants highlighted the lack of interactivity and the minimal engagement as weaknesses in current arrangements to address developments in science and technology. Other participants felt that such metrics did not reflect broader impacts from passive participation. Anecdotal evidence was discussed as to the benefits of awareness raising and education of passive participation.

The importance of measuring output as well as input was noted. There were opportunities to attempt to capture what States Parties had done, collectively or individually, as a result of the work of the science advisory process. This would likely involve abstracting information provided during other meetings of the BTWC, such as national statements and updates made during a Meeting of States Parties.

A third measure was felt to be the degree of satisfaction amongst States Parties. A science advisory process would be a success if States Parties felt it was useful and assisting them in their work. It was pointed out that such a process would not be the property of individual States Parties but of the membership of the BTWC as a whole, suggesting that the collective satisfaction with a process would be a better measure of success.

When?

When should the advisory group meet and how often?

Participants were asked to consider whether the science advisory process should meet on a regular basis, upon request, or when triggered by some other element. There was broad agreement that conducting such reviews every five years at review conferences was too infrequent and that more regular, more tightly focused annual reviews would be useful. Participants also highlighted that different types of activity might be needed with different frequency or time frames. Overarching trend reviews might be needed less frequently. Answers to specific questions or addressing specific topics might be achieved with a fixed time frame set in advance. Responding to real world developments, might necessitate immediate action and prompt consideration.

Whilst participants argued that the amount of time a process would need to meet would be dependent upon the tasks it is allotted and the rate and scale of the developments covered, there was also broad recognition that practical considerations, such as cost, will limit the time available. It was unclear which factor would likely have a greater impact on decisions as to how often and for how long the process might meet.

There was broad support for making most effective use of meeting time as possible, including through thorough preparation. There was also a discussion over the use of remote working and audio/visual conferencing tools to increase the amount of time that could be spent addressing these issues with a minimum cost implication. Several participants pointed out that such tools are still unavailable or unreliable in many parts of the world.

When during the BTWC cycle should this occur?

It was suggested that the science advisory process should meet prior to other work undertaken by States Parties, allowing its output to be fed in to, and influence their discussions. Other participants suggested that it might meet in parallel to other BTWC meetings, such as the Meeting of Experts, to minimize the logistical burdens on participants.

Where?

Where should the advisory process be based or meet?

There may be advantages to holding meetings of the process in Geneva before or in parallel with other meetings of the BTWC. The ISU is also based in Geneva simplifying the provision of administrative support. The high costs of holding meetings in Geneva was noted.

Participants discussed the possibility of rotating meetings of the process throughout different regions. One model would be to move the meeting through the large United Nations conference once per intersessional work programme: with annual meetings in Geneva, Bangkok, Nairobi and New York. This would enable experts from each region to participate without the need for intercontinental travel at least once per cycle. This should increase the range and type of expertise available to the process. It should also offer significant cost savings, given the comparative meeting costs between these centres (noting that there will be new costs involved with moving core administrative support to new locations). Several participants felt such a model could help foster greater buy in for the treaty around the world.

How do the models for a scientific advisory process currently under discussion for the BTWC address these questions?

During the final session of the meeting, participants worked in small groups to consider the proposals contained in the working papers submitted to the PrepCom in light of the above questions. Summaries provided by the rapporteurs provided an overview of the discussions.

Working group A

The group felt that a science advisory process should promote awareness and buy-in and be simple, flexible, visible and have ownership by States Parties. The process could usefully: assist in providing an overview of trends in science and technology to facilitate the work of review conferences; address specific questions of interest to States Parties; provide distilled summaries for policy makers; and conduct outreach or briefings on its findings.

For any topic examined through such a process, the group suggested considering an overview of the development, its possible impacts, actions that could be taken, and the consequences of not taking action. When determining the format of the process, the group stressed the importance of addressing diversity of scientific expertise, geographic diversity, and sponsorship for participation of experts from developing countries.

Identifying the topics that a science advisory process would address should be a two-way process. It will be necessary to draw upon both the priorities of States Parties and the views of scientists involved in emerging fields of science and technology that could have implications for the BTWC. The group also noted that national working papers can play a role in flagging possible issues to be considered by a process.

On the output of the process, the group also noted importance of recording both where there is consensus among experts as well as where there are disagreements or differences of opinion on the issues being considered. There was recognition of the need to have arrangements in place to feed the output from such a process into the broader work of the BTWC.

The group also discussed the advantages and disadvantages of different approaches. An advisory committee or board provides consistency and a more nuanced understanding of the policy framework in which the advisory process is working but will need to work to expand the range of available expertise given the scale and scope of topics which could become relevant. A more open-ended approach would help expand the range of expertise on which the process might draw but might be harder to focus on specific tasks. Either way, the group stressed the importance of having a consistent support that can help maintain momentum, assist in preparing the reports, and understand the science/policy and BTWC interfaces. The group also raised the possibility of developing more concrete costings for the models under discussion and perhaps compare them to the costs for parallel activities in other processes.

Working group B

The group spent a good deal of time reviewing the details of the different proposals for a science advisory mechanism. The group found that regardless of the model, it would be important to separate the process from other BTWC meetings. Such meetings can provide important opportunities to interface with policy discussions. The Meeting of Experts could be briefed on the efforts of the science advisory process and a formal report could be delivered to the Meeting of States Parties.

The group also noted the impact of having the right Chair on likelihood of success. An individual that could bridge the science policy divide, whilst remaining a credible authority in the eyes of technical experts would facilitate the work of the process. It would also be important that the Chair can commit sufficient time and effort to help drive the process.

The reporting process itself was also considered. Well drafted summaries and executive findings were felt to be particularly important. There was also a discussion as to whether the report should be on behalf of the Chair (as it would be their views, it would not need to be agreed by consensus) or the process (in which case it would need to be developed and agreed by consensus). The former is quicker and simpler but may have less stature. The latter may be more representative but would likely consume valuable meeting time. Developing a policy-focused summary might be simpler for the former but more challenging in the latter, especially to capture the nuances required to reach consensus. The different models for a science advisory process also seemed to impact reporting decisions. This group felt that reaching agreement on a consensus report in an open ended setting would use too much of the time allocated for substantive discussions. The group also noted the importance of recording differences in opinion as well as consensus findings.

The group also discussed what might happen when there are incompatibilities between technical findings and political realities.

When considering how to engage the necessary expertise, there was broad agreement amongst the group that the participation of professional scientific organizations was important. In general, such a process should be inclusive, rather than exclusive. In models where the number of participants is limited, the group discussed the challenges of ensuring appropriate representation across expertise and geographic distribution. There was broad agreement that membership should be based primarily on technical expertise. The group also considered the cost implications of each of the two models. In a committee or board, costs to subsidize the participation of experts would likely be centralized and split across the treaty's full membership. For an open ended working group such sponsorship would be more likely be financed through the use of voluntary funds, presumably placing the burden on a much more limited number of states.

The institutional support requirements of the two proposed models were considered. In general, this was felt to be roughly equal regardless of the model chosen. There was broad agreement that additional support would be needed. Such support could be provided either by dedicated staff for the ISU or through the use of consultants. Either way, the group felt that the ISU would likely need additional resources to support outreach and engagement with scientific and technical communities, including an increased travel budget.

As a concrete next step, this group recommended bringing together all those that have proposed models or engaged with the development of a science advisory process for an exchange of views. Despite differences in approach there seemed to be an emerging consensus among BTWC States Parties that such a process is needed. It was important to build upon these shared priorities. Whilst additional informal meetings were felt to have some utility, members of this group felt that it was necessary to start moving towards more formal discussions.