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Assessing the SecBio Platform Proposal for the Biological Weapons Convention

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ABBREVIATIONS AND ACRONYMS

BWC	Biological and Toxin Weapons Convention
EENeT	European Expert Network on Terrorism Issues
EMR	Educational Module Resource
OPCW	Organization for the Prohibition of Chemical Weapons
TI	Targeted Initiative
UNSCR	United Nations Security Council resolution
VERTIC	Verification Research, Training and Information Centre
WHO	World Health Organization

SUMMARY

Biosecurity and biosafety are important aspects of the life sciences and they have been discussed in the Biological Weapons Convention (BWC) on several occasions. Moreover, several initiatives are underway to advance biosecurity and safety. However, these initiatives are often context specific and the effective implementation of biosecurity and biosafety measures around the globe remains inadequate.

To address this gap, in 2022, France, Senegal and Togo submitted a revised proposal to the BWC for the "establishment of an international platform dedicated to biosecurity and biosafety: SecBio". The proposal includes three pillars: a searchable **repository** for biosafety- and biosecurity-related materials; a **learning module**; and a **forum** for expert networking to exchange information, data and best practices. A prototype of the online platform has been in development since March 2020. This report draws lessons from past initiatives in these areas to identify options for consideration in the development of the SecBio platform.

There have been several initiatives designed to collect and collate data related to laws and regulations as part of some form of biosafety and biosecurity **repository**. Experience suggests that the development of repositories requires resources; explicit boundaries on the scope of materials; a clear understanding of the end-user requirements; careful attention to the indexing, categorizing and validation of material; and account to be taken of copyright issues and consideration of aspects of security to ensure that the information is used responsibly. To advance the repository it could be useful to, among other things, refine the objectives, survey the end users, and develop a resource-mobilization and sustainability plan.

The second pillar of the SecBio proposal is "a **learning module** for users to build a project and challenge their knowledge". The concept of a learning module can take many different forms. Lessons from similar initiatives suggest that it is important to have clarity on the particular objectives and scope of any learning initiative as well as the envisaged end users. Resources will also be important in sustaining any initiative along with a strategy for promoting materials and ensuring uptake by key actors. To advance this pillar, BWC states parties could, among other things, develop clarity around the objectives of the module and build a strategy for its dissemination and uptake.

The SecBio proposal calls for "a **forum** for expert's networking to exchange information, data and best practices". The forum is a valuable aspect of the proposal but perhaps also the most challenging of the three pillars. Online expert forums are increasingly used in many fields and several lessons can be drawn from these experiences. First is that sustaining online interest is difficult as enthusiasm can wane over time. A second issue is recruiting a suitably diverse yet engaged set of participants. A third challenge is focusing and moderating expert exchanges to prevent conversations becoming derailed or divisive. To address some of these issues, BWC states parties could consider an international launch of the forum to identify and invite an initial set of participants. The forum will also require a strategy for stimulating sustained engagement as well as moderating the discussion.

There are many options for advancing the SecBio initiative. Three possible packages of activity are outlined in the matrix below along with an assessment of the resource requirements and limitation in each of these measures. Three underlying challenges are evident: **mobilizing resources**, **sustaining the initiative**, and **providing clarity on the objectives and end users** of the different pillars. Addressing these points could facilitate convergence around the idea and perhaps open opportunities for partnerships to leverage existing efforts to avoid duplication.

	Option 1 A repository of information material	Option 2 A platform for exchange	Option 3 Comprehensive resource for good practices
Searchable Repository	Collection of treaties, laws, regulations, case law, norms, standards, etc. submitted on a voluntary basis by states parties and ordered by submitting party	Voluntary contributions thematically ordered and labelled by submitter to facilitate targeted retrieval and better engagement with the deposited material	Contributions coded by content and scope of instruments to enable advanced searches, with curated examples of good practices in different instruments
Learning Module	Collection of existing training and available courses submitted on a voluntary basis by states parties	Collection of existing material coded and labelled by submitter for subject matter and target audience	Curated section with vetted training and information material addressing technical, operational and normative aspects of biosafety and biosecurity
Forum for Experts	Open forum for voluntary contributions, to raise questions and contribute information	Ad hoc engagement with the open forum on specific subjects to identify good practice examples in the collected material	Regular targeted engagement with a broad group of relevant experts on specific topics to identify, analyse and curate good practices
Resources	Low costs associated with maintenance	Low resources required to administer submissions and keep records up to date	High resources required for administration and maintenance and support
Challenges	Standardization and quality control of materials; sustainability of effort; representativeness of submitted material	Sustainability of effort; administration of expert forum; representativeness of submitted material	High resource requirement; agreement on good practice and material-vetting process; expert recruitment and retention

1. INTRODUCTION

The proposal for the "establishment of an international platform dedicated to biosecurity and biosafety: SecBio" in the framework of the Biological Weapons Convention (BWC) was first tabled by France in November 2020.[1] In March 2022, France, Senegal and Togo submitted a revised version of the proposal for consideration at the Preparatory Committee for the Ninth BWC Review Conference.[2] The proposal contains three pillars:

1. A searchable repository for biosafety and biosecurity documents covering the legal framework, treaties, laws, regulations, case law, norms, standards and best practices, as well as scientific publications
2. A learning module for users to build a project and challenge their knowledge
3. A forum for expert networking to exchange information, data and best practices

This proposal for an international information platform dedicated to biosecurity and biosafety addresses an important gap. However, to maximize the value of any such platform, several factors warrant further consideration.

To this end, this report draws lessons from past initiatives to develop repositories, learning modules and expert forums in order to inform the development of the SecBio platform (and any such similar initiatives). The report begins with an overview of the importance of biosafety and biosecurity in the context of the BWC. It then proceeds to look at each of the platform pillars in turn, drawing from past experiences to identify lessons and develop options for state parties to consider.

[1] This drew from a Working Paper issued in 2019: France, "An exchange platform for voluntary transparency exercises", BWC/MSP/2019/MX.3/WP.5, 28 July 2019, https://undocs.org/en/bwc/msp/2019/mx.3/wp.5

[2] Three versions of the proposal have been submitted to states parties. The initial proposal was submitted by France, BWC/MSP/2020/MX.1/WP.3, 16 August 2021. Followed discussion of the proposal during the BWC Meetings of Experts (MX1 on Cooperation and Assistance, with a Particular Focus on Strengthening Cooperation and Assistance under Article X) held on 30–31 August 2021, a second version was submitted by France and Togo, BWC/CONF.IX/PC/WP.1, 14 December 2021. In March 2022 a revised proposal was submitted by France, Senegal and Togo: Preparatory Committee for the Ninth Review Conference of the Biological Weapons Convention, "Revised proposal for establishment of an international platform dedicated to biosecurity and biosafety: SecBio", Working paper submitted by France, Senegal and Togo, BWC/CONF.IX/PC/WP.1/Rev.1, 25 March 2022, https://undocs.org/en/BWC/CONF.IX/PC/WP.1/Rev.1.

2. BACKGROUND

Article IV of the BWC states:

> *Each State Party to this Convention shall, in accordance with its constitutional processes, take any necessary measures to prohibit and prevent the development, production, stockpiling, acquisition or retention of the agents, toxins, weapons, equipment and means of delivery specified in Article I of the Convention, within the territory of such State, under its jurisdiction or under its control anywhere.*[3]

The article links the obligations under Article I with the domestic provisions of states parties. It thus lays the foundation for national implementation measures, including measures related to biosafety and biosecurity.

Biosafety (i.e., the prevention of unintentional exposure to biological agents or their inadvertent release) and biosecurity (i.e., the prevention of unauthorized access, loss, theft, misuse, diversion or release to reduce the risks of accidents and of inadvertent and deliberate misuse of the life sciences) are important aspects of the modern life sciences.[4] Widespread efforts have been made to enhance them and they have been discussed in the BWC on several occasions.[5]

Efforts to enhance biosafety and biosecurity are context specific. Legal frameworks, norms and rules as well as priorities and resources necessarily differ widely between countries and various contexts.[6] As such, good or best practice is context dependent and dynamic. As the World Health Organization (WHO) points out:

> *Governance systems and mechanisms for biorisks will depend on context. Member States vary in terms of level of resources, regulatory environments, risk tolerance and*

[3] Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction, https://treaties.unoda.org/t/bwc, Article IV.

[4] There is no universally agreed definition of biosafety and biosecurity. The choice of words here follows the definitions found in World Health Organization, Laboratory Biosafety Manual, 4th ed., 2022, https://apps.who.int/iris/handle/10665/337956. WHO defines "life sciences" as "All sciences that deal with living organisms, including humans, nonhuman animals, plants and agriculture, and the environment, or products of living organisms or that incorporate components derived directly or synthetically from living organisms; the life sciences include but are not limited to biology, biotechnology, genomics, proteomics, bioinformatics, pharmaceutical and biomedical research and technologies." World Health Organization, Global Guidance Framework for the Responsible Use of the Life Sciences: Mitigating Biorisks and Governing Dual-use Research, 2022, https://www.who.int/publications/i/item/9789240056107, p. xxi.

[5] See, for example, BWC Meeting of States Parties, "Report of the Meeting of Experts", BWC/MSP/2008/MX/3, 8 September 2008, available at: https://undocs.org/en/BWC/MSP/2008/MX/3. WHO defines "life sciences" as "All sciences that deal with living organisms, including humans, nonhuman animals, plants and agriculture, and the environment, or products of living organisms or that incorporate components derived directly or synthetically from living organisms; the life sciences include but are not limited to biology, biotechnology, genomics, proteomics, bioinformatics, pharmaceutical and biomedical research and technologies." World Health Organization, Global Guidance Framework for the Responsible Use of the Life Sciences: Mitigating Biorisks and Governing Dual-use Research, 2022, https://www.who.int/publications/i/item/9789240056107, p. xxi.

[6] This has been recognized in past BWC Meetings of States Parties. See for example BWC Meeting of States Parties, Report, BWC/MSP/2008/5, 12 December 2008, https://undocs.org/en/BWC/MSP/2008/5, p. 4.

> *types of research conducted; thus, it is not possible or appropriate to have a one-size-fits-all approach to governance in this area.*[7]

There have been several initiatives to advance biosecurity and biosafety around the globe.[8] However, it is evident that effective implementation of biosecurity and biosafety measures is lacking in many cases and that there is "a critical lack of awareness" of biorisks.[9]

The SecBio proposal, with its three pillars, provides an opportunity to address some of these issues and to minimize biorisks by providing materials and support to implement biosecurity and biosafety measures. The proposal offers a potentially dynamic way to exchange ideas and information and to coordinate approaches in this area. In the process, the platform could actively contribute to the exchange of materials and information for peaceful purposes, as required under Article X of the Convention. In time, this initiative could contribute significantly to strengthening the effectiveness of the Convention.

The proposed SecBio concept is a collaborative online platform dedicated to biosafety and biosecurity. The platform "is intended to be a development support tool in the field of biosafety and biosecurity" in order to address pressing global challenges in all dimensions.[10] A prototype has been in development since March 2020.[11] The SecBio concept aims to become a key international reference point for biological safety and security, and is based on three pillars: a searchable repository; a learning module; and a forum for experts.[12]

The analysis in the following three chapters is guided by the text of the proposal, which outlines the platform and its objectives. This analysis is informed by experiences with similar initiatives. Taking each pillar in turn, the report provides: first, an overview of the purpose of the pillar; second, insights into past experiences to identify potential challenges and lessons; and, finally, options to advance each of the platform pillars.

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[7] World Health Organization, Global Guidance Framework for the Responsible Use of the Life Sciences: Mitigating Biorisks and Governing Dual-use Research, 2022, https://www.who.int/publications/i/item/9789240056107, p. 39.
[8] See, for example, in National Academies of Sciences, Engineering, and Medicine, Governance of Dual Use Research in the Life Sciences: Advancing Global Consensus on Research Oversight: Proceedings of a Workshop, National Academies Press, 2018, https://doi.org/10.17226/25154, Appendix E "Examples of Activities Across the Governance Landscape".
[9] As the WHO Global Guidance report indicates, "governance and oversight frameworks to manage the risks posed by science and technologies lag behind developments and innovation in the life sciences . . . there is a critical lack of awareness of these biorisks." See World Health Organization, Global Guidance Framework for the Responsible Use of the Life Sciences: Mitigating Biorisks and Governing Dual-use Research, 2022, https://www.who.int/publications/i/item/9789240056107, p. xxv.
[10] BWC/CONF.IX/PC/WP.1/Rev.1, 25 March 2022, para. 4.
[11] The authors of this report were able to view and test the prototype SecBio platform (www.secbio.org). The proposal states: the "prototype version aims to illustrate what the tool could be and its main features and functionalities. On this basis, the States Parties could then agree, at the ninth Review Conference of the Convention, to adopt an online platform dedicated to biosafety and biosecurity". BWC/CONF.IX/PC/WP.1/Rev.1, 25 March 2022, para. 13.
[12] BWC/CONF.IX/PC/WP.1/Rev.1, 25 March 2022, para. 6.

3. SEARCHABLE REPOSITORY

The first pillar of the SecBio proposal is "a searchable repository for biosafety and biosecurity legal framework[s], treaties, laws, regulations, case law, norms, standards and best practices, as well as scientific publications".

The aim is to establish a comprehensive database of documents relevant to biosafety and biosecurity. These would include international conventions and treaties, national legislation and regulations, professional and industry agreements, best practices and guidelines documents, norms and standards, and scientific publications. Where possible, the database would host the full text of the relevant documents or, where that is not possible (e.g., for copyright reasons), it would link to the material.

3.1 PAST EXPERIENCES AND LESSONS

There have been several initiatives designed to collect and collate data related to laws and regulations (see box 1 for illustrative examples). Few, if any, have attempted to comprehensively collect and collate scientific publications along with international resources on standards and best practice related to biosafety and biosecurity.

Box 1. Illustrative Examples of Repositories and Related Initiatives

VERTIC's BWC Legislation Database

A successful and enduring example is the BWC Legislation Database, which is part of the National Implementation Measures (NIM) programme of the Verification Research, Training and Information Centre (VERTIC).[13] Launched in April 2002, the database was based on a survey that VERTIC undertook into the status of national implementation under the BWC. This database has emerged as a key resource in the field. It has more than 1,500 documents and is updated on a regular basis as further surveys are completed. For several years, VERTIC's database has been viewed as the key source of material on BWC legislation.

UNSCR 1540 Matrices

In 2004, the United Nations Security Council unanimously adopted resolution 1540 (UNSCR 1540).[14] This legally binding resolution mandates all states to adopt and enforce effective laws and measures to prevent the proliferation of nuclear, chemical and biological weapons and their means of delivery, including appropriate controls on related materials.[15] The 1540

[13] VERTIC, BWC Legislation Database, https://www.vertic.org/programmes/nim/biological-weapons-and-materials/bwc-legislation-database/.

[14] United Nations Security Council Resolution 1540 (2004), S/RES/1540, 28 April 2004, https://undocs.org/en/S/RES/1540(2004).

[15] The resolution defines "related materials" as "materials, equipment and technology covered by relevant multilateral treaties and arrangements, or included on national control lists, which could be used for the design, development, production or use of nuclear, chemical and biological weapons and their means of delivery". United Nations Security Council Resolution 1540 (2004), S/RES/1540, 28 April 2004, https://undocs.org/en/S/RES/1540(2004).

Committee uses a matrix to organize information about implementation of the resolution.[16] This information is submitted by states and complemented with information available from official government sources and intergovernmental organizations and approved by the committee.[17]

Biosecurity Central

A recent example of an online repository is Biosecurity Central, a publicly available web-based library for key areas of biosecurity. The library is a searchable and filterable database of international biosafety and biosecurity resources, published by governmental, international and non-governmental organizations.[18] A group of experts provided advice, recommendations and ongoing review for the resource library. This is an initiative of the Canadian Government's Weapons Threat Reduction Program, the Georgetown University Center for Global Health Science and Security, and Talus Analytics.

Sussex Harvard Information Bank

Another notable initiative is the Sussex Harvard Information Bank (SHIB), a collection of more than 200 linear metres of documents pertaining to chemical and biological weapons, the norm against their use, and the chemical and biological weapon regimes. It is perhaps the world's largest repository of open-source information on chemical and biological weapons and includes a wealth of scientific and scholarly publications.[19]

One of the key lessons from the development of repositories is that collecting and collating data requires **resources**. In the case of the Sussex Harvard Information Bank (SHIB), scholarly materials are gathered through a dedicated scanning process undertaken by staff and a network of "collaborating literature-scanners worldwide".[20] This process requires resources, as does the labelling and cross-referencing of documents, which are essential for retrieval of material and usability of any archive. In the case of both VERTIC's BWC Legislation Database and the UNSCR 1540 Matrices, substantial effort was required to collect the relevant material and to maintain the respective repositories. Even in the case of the UNSCR 1540 Matrices, where information is submitted by states (as is envisioned in the SecBio proposal), the procedure for processing, corroborating and approving new materials requires substantial resources.[21]

[16] The resolution established the 1540 Committee, as a subsidiary body of the Security Council. Its mandate and scope of activities are derived from resolution 1540 (2004) and renewed by resolutions 1673 (2006), 1810 (2008), 1977 (2011), 2325 (2016), 2572 (2021), 2622 (2022) and 2663 (2022).

[17] For more information, see United Nations, Security Council, 1540 Committee, "1540 matrices", https://www.un.org/en/sc/1540/national-implementation/1540-matrices.shtml.

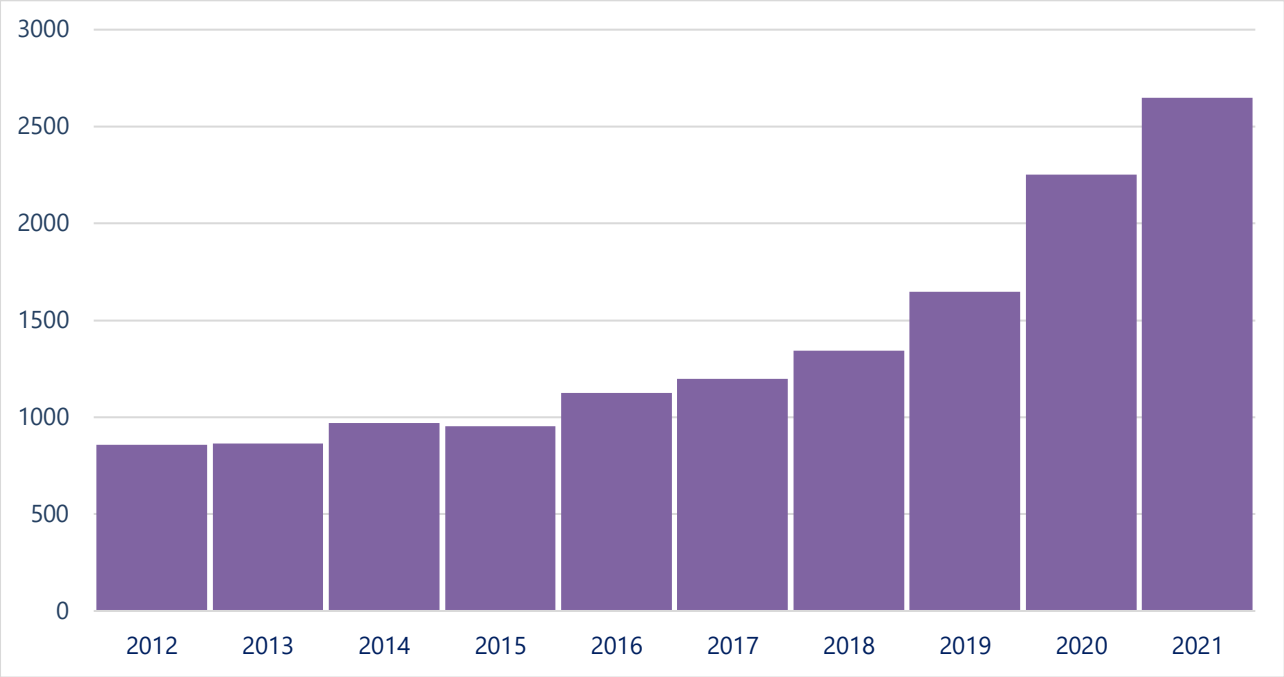
[18] Biosecurity Central, https://biosecuritycentral.org.

[19] The SHIB is maintained by the Harvard Sussex Program and is mainly housed at the University of Sussex. Harvard Sussex Program, "SHIB", at: http://hsp.sussex.ac.uk/new/what-we-do/shib/.

[20] Harvard Sussex Program, "SHIB", http://hsp.sussex.ac.uk/new/what-we-do/shib/.

[21] It is worth noting that not all states have presented their national reports on implementation of resolution 1540 (2004) to the 1540 Committee, despite this being a requirement under the binding resolution. See, for instance, United Nations Security Council Resolution 2325 (2016), S/RES/2325, 15 December 2016, https://undocs.org/en/S/RES/2325(2016).

FIGURE 1. SCIENTIFIC PUBLICATIONS ON BIOSECURITY AND BIOSAFETY, 2012-2021[22]



A second lesson from past experiences is the importance of setting boundaries on **the scope** of any repository. Relevant legislative and regulatory measures could include a range of possible materials. In the cases of VERTIC and the UNSCR 1540 Matrices, the scope and bounding of the submitted information are managed respectively using a survey and a matrix template which specify the measures required for inclusion. Nonetheless, these materials are dynamic, especially in the rapidly evolving area of the life sciences. This suggests that a repository would require sustained attention to ensure that the information is up to date. Collecting scientific publications related to biosafety and biosecurity is an even greater challenge. A cursory search of Scopus for scientific articles with the words "biosafety" or "biosecurity" in the title, keywords or abstract gathers more than 20,000 results. Notably, the number of relevant publications per year is growing (see figure 1) and more than 2,000 articles were published in 2020 and 2021 and the trend is continuing in 2022.[23] Clarity around what to include and what is outside the scope of the repository will be important.

A third lesson is that the **indexing and categorizing** of material is important in making a repository useable. This requires careful consideration from an early stage. However, an ongoing process of curation may be required to ensure that relevant material is retrievable, and that searches are responsive to user needs. For example, new categories may need to be added and redundant ones may need to be removed or combined with other, more appropriate categories. Curation, including the consistent labelling and categorization of

[22] This is based on data in the Scopus database using the search string "TITLE-ABS-KEY (biosecurity OR biosafety)", as of November 2022.
[23] Scopus is an abstract and citation database provided by the Netherlands-based academic publishing company Elsevier. The search string "TITLE-ABS-KEY (biosecurity OR biosafety)" yielded 22,322 documents, including 15,346 documents over the last 10 years.

material, is potentially resource intensive and requires a complete understanding of the archive and the materials to be included.

A fourth lesson is that materials in any database may also need to be **validated**, particularly materials related to national implementation of biosafety and biosecurity. Documents added to VERTIC's database are assessed by senior experts and corroborated with other open-source materials. The documents included in the 1540 database are submitted by states, which makes the process easier. However, some corroboration with other sources is required as well as the approval of the 1540 Committee.

Even when based on open-source material, **security and copyright** are important considerations to ensure that the information is used responsibly. Security can be particularly challenging when dealing with technical materials on particularly sensitive topics. Issues of access are further compounded by copyright obligations. Many scholarly journals require authors to transfer copyright of articles to the journal prior to publication.[24] The SecBio prototype addresses this by using electronic links to documents, but if multiple users are expected to provide materials, guidance and standards may need to be developed.

A final, interconnected challenge is determining the **end user** of any repository. Clarity on the user and uses can help focus the database and engineer a system suited to end-user requirements.

3.2 OPTIONS FOR THE FURTHER DEVELOPMENT OF THE REPOSITORY

To address these challenges, several options could be considered further in advancing the SecBio proposal. These are outlined in table 1.

TABLE 1. OPTIONS FOR THE DEVELOPMENT OF THE REPOSITORY

Criteria for the Inclusion of Material	It would be useful to clearly define the criteria for the inclusion of material. This is particularly important in relation to scholarly publications. Depending on the availability of resources, it may be necessary to narrow down the scope of scientific papers with a view to focusing the content. In time, the scope could potentially expand as required.
Survey End Users	To better understand end user requirements, it might be useful to survey a broad range of prospective end users to get a sense of their biosafety and biosecurity needs and better understand how they might use the database.
Develop a Sustainability Plan	States might usefully consider a sustainability plan for the repository. The SecBio proposal suggests that the platform is managed collaboratively, fed by voluntary contributions from states parties

[24] National Academies of Sciences, Engineering, and Medicine, Open Science by Design: Realizing a Vision for 21st Century Research, National Academies Press, 2018, https://doi.org/10.17226/25116, p. 28.

	and international organizations. This approach spreads the burden of data collection, but the sustainability of such a collaborative voluntary approach is unclear and may require the development of common standards around data collection.[25]
Central Broker(s)	All the examples cited above depend upon a central broker (or brokers) to maintain the database and ensure that the material held is both accurate and relevant.
Resources, Resources, Resources	Connected with the above is the resource requirement for maintaining the database. There are several options available to facilitate collaboration among states parties and international partners to reduce the resource burden on the BWC Implementation Support Unit (ISU) to basic administrative tasks. None of the options is cost free.
Map Out Existing Measures	As indicated above, there are already several existing resources related to biosecurity and biosafety. It may be useful to map out the existing mechanisms and the information that they already hold and which could be drawn upon. This can be done either in collaboration with external partners, such as VERTIC or the 1540 Committee, or using relevant existing documents such as the submitted BWC Confidence-Building Measure reports pertaining to legislation, regulations and publications, where these are available.

[25] From the authors' experience, initial enthusiasm for voluntary sharing information in informal collaborative networks wanes over time as other pressures and priorities emerge.

4. LEARNING MODULE

The second pillar of the SecBio proposal is "a learning module for users to build a project and challenge their knowledge". Biosafety and biosecurity training and awareness are essential to be able to recognize and manage biorisks, and many initiatives have been undertaken to raise awareness in relevant stakeholder groups. Despite these initiatives, concern continues to be expressed around the lack of awareness of the potential for misuse in the life sciences.[26]

4.1 PAST EXPERIENCES AND LESSONS

There is, therefore, ample scope for the proposed learning module to fill a gap. However, the concept of a learning module can have different objectives and take many different forms, from lectures, workshops and seminars to sophisticated multimedia-enabled courses (as illustrated in box 2).

Box 2. Illustrative Examples of Learning Modules and Related Initiatives

OPCW Education and Outreach

The Organization for the Prohibition of Chemical Weapons (OPCW) provides one useful example of a repository of educational materials for students, educators, civil society and policymakers.[27] OPCW materials include online educational modules for National Authorities and stakeholders associated with the implementation of the Chemical Weapons Convention; an interactive website exploring multiple uses of chemicals, including key concepts with dedicated sections for students and educators; a collaborative educational programme delivered with an academic partner as an executive course; and links to further resources on conducting more effective education and outreach. Additionally, The Hague Ethical Guidelines were developed with the aim of promoting a culture of responsible conduct in the chemical sciences and to guard against the misuse of chemistry.[28]

[26] Lack of awareness in the scientific community is persistent leading WHO to call it a "chronic and fundamental challenge". WHO (2022). World Health Organization, Global Guidance Framework for the Responsible Use of the Life Sciences: Mitigating Biorisks and Governing Dual-use Research, 2022, https://www.who.int/publications/i/item/9789240056107, p. 6. See also Seventh BWC Review Conference, "Possible approaches to education and awareness-raising among life scientists", Working paper submitted by Australia, Canada, Japan, New Zealand, Republic of Korea and Switzerland (on behalf of the "JACKSNNZ"), and Kenya, Sweden, Ukraine, the United Kingdom of Great Britain and Northern Ireland and the United States of America, BWC/CONF.VII/WP.20/Rev.1, 1 December 2011, https://undocs.org/en/BWC/CONF.VII/WP.20/Rev.1; and M. Dando, "Teaching Biosecurity", Bulletin of the Atomic Scientists, 2 December 2010, https://thebulletin.org/2010/12/teaching-biosecurity/.

[27] OPCW, "Education and outreach", https://www.opcw.org/resources/education-and-outreach.

[28] OPCW, "The Hague Ethical Guidelines", 2015, https://www.opcw.org/hague-ethical-guidelines. Another notable code of conduct is the Tianjin Biosecurity Guidelines for Codes of Conduct for Scientists. These guidelines were developed through a collaboration between the Johns Hopkins Center for Health Security, the InterAcademy Partnership, and the Tianjin University Center for Biosafety Research and Strategy to address the lack of commonly accepted guiding principles for international biosecurity practice. "The Tianjin Biosecurity Guidelines for Codes of Conduct for Scientists",

University of Bradford Educational Module Resource

Bradford university has developed several biosecurity-related educational materials, including the Educational Module Resource (EMR). The EMR serves as a resource for educators. It comprises 21 lectures and related materials designed to be "modified and tailored in order to fit the requirements of different local educational contexts".[29]

European Union Targeted Initiatives

Initiatives sponsored by the European Union that target dual-use export control offer a different form of learning resource. The Targeted Initiative (TI) on "Export Controls of Dual-Use Materials and Technologies in Central Asia" started in September 2017.[30] A similar TI began in 2018 focusing on the GUAM countries (i.e., Georgia, Ukraine, Azerbaijan and Moldova). Both initiatives operate on a regional level but implement individual projects with a local focus. The bottom-up rather than top-down approach aims to facilitate local and regional networks of stakeholders (universities, research institutes, government officials, industry, non-governmental organizations, etc.) and support the development of capacity and expertise. It also supports the development of enabling tools such as dedicated courses for higher education and the stakeholder communities, creating bespoke teaching materials and handbooks, and bringing stakeholders together at the national and regional levels.

Assistance Support Initiative

An example of providing information on existing initiatives and programmes is the Catalogue of Civil Society Assistance for BWC States Parties maintained by Georgetown University Center for Global Health Science and Security and the Henry L. Stimson Center.[31] This catalogue is part of the Assistance Support Initiative (ASI) supporting implementation of United Nations Security Council resolution 1540. It is built on information gathered from providers or implementers of assistance, including governments, international, regional and subregional organizations, and civil society bodies, as well as examination of a range of official sources.

2021, https://www.centerforhealthsecurity.org/our-work/Center-projects/IAPendorsementTianjinCodes/20210707-IAP-TianjinGuidelines.pdf.

[29] University of Bradford, "English language version of the Educational Module Resource (EMR)", https://www.bradford.ac.uk/bioethics/educational-module-resources-emr/english-language-version-of-educational-module-resource-emr/

[30] The TI on "Export Controls of Dual-Use Materials and Technologies in Central Asia" is financed by the EU's Instrument contributing to Stability and Peace (IcSP) and it is implemented by the International Science and Technology Center (ISTC). The TI on "Export Controls of Dual-Use Materials and Technologies in GUAM Countries" is also funded by the EU's IcSP and is implemented by the Science and Technology Center in Ukraine (STCU). The participating ISTC countries are Kazakhstan, Kyrgyz Republic, Tajikistan, Uzbekistan, Turkmenistan, Armenia, Georgia, Afghanistan and Pakistan; and the participating STCU countries are Azerbaijan, Georgia, Moldova, Ukraine (GUAM) and Uzbekistan.

[31] Georgetown University Center for Global Health Science and Security and Henry L. Stimson Center, "Catalogue of Civil Society Assistance for BWC States Parties", https://www.stimson.org/2020/catalog-of-civil-society-assistance-for-bwc-states-parties/. It is part of the Assistance Support Initiative (ASI), that can be accessed at https://1540assistance.stimson.org/assistance-database/.

There are several lessons that can be taken from existing educational initiatives. First, it is important to have clarity on the **objectives and scope** of any learning initiative.[32] In its current form, the SecBio platform prototype provides access to existing materials. It is conceived as an extension of the repository, facilitating access to guidelines, handbooks and e-learning courses. Yet, the module could also function as a hub for the creation of new teaching and learning materials. A hybrid of these two functions is also conceivable, through a process of building on existing material, including curating, selecting and recommending material based on defined criteria.

A second lesson from previous initiatives is the importance of clarity around the **end user** of any learning module. The possible users of a learning module range from researchers, including scientists and technicians, to funders and publishers, from national governments to civil society actors including the public, and regulators. These stakeholders can each have different roles and responsibilities in biosafety and biosecurity and, correspondingly, may have particular requirements.[33] It is therefore important to tailor learning materials to suit the audience and their particular context or perhaps even co-produce material with users to ensure that it reflects the users' local context and makes sense in relation to specific projects.

A third lesson is the importance of **resources and sustainability**. A decisive factor for initiatives to succeed is the availability of resources. Many initiatives have proven difficult to sustain in the long term in part due to a lack of funding, resulting in the disintegration of otherwise vibrant networks. To ensure longevity, the design of initiatives with sustainability in mind is therefore important.[34]

A fourth lesson is that learning materials are of little value unless they are disseminated and taken up by those they are designed to inform. This is particularly challenging as biosecurity and biosafety are not necessarily a high priority or well understood, and material on a website is of little value unless it can be successfully distributed. Measures to **disseminate and incentivize uptake** are therefore important.[35]

4.2 OPTIONS FOR THE DEVELOPMENT OF THE LEARNING MODULE

Based on the above analysis, options that could be considered further in the development of the learning module are outlined in table 2.

[32] B. Rappert (ed), Education and Ethics in the Life Sciences, ANU E-Press, 2010, http://doi.org/10.22459/EELS.06.2010.
[33] An excellent reference to different stakeholders and their roles in responsible use of the life sciences can be found in World Health Organization, Global Guidance Framework for the Responsible Use of the Life Sciences: Mitigating Biorisks and Governing Dual-use Research, 2022, https://www.who.int/publications/i/item/9789240056107.
[34] National Academies of Sciences, Engineering, and Medicine, Governance of Dual Use Research in the Life Sciences: Advancing Global Consensus on Research Oversight: Proceedings of a Workshop, National Academies Press, 2018, https://doi.org/10.17226/25154, p. 96.
[35] World Health Organization, Global Guidance Framework for the Responsible Use of the Life Sciences: Mitigating Biorisks and Governing Dual-use Research, 2022, https://www.who.int/publications/i/item/9789240056107.

TABLE 2. OPTIONS FOR THE DEVELOPMENT OF THE LEARNING MODULE

Clarity of Objectives	Explore the objectives of the module and seek convergence around whether the aim is to raise awareness, to sensitize, to instil new ways of thinking and different approaches, to convey technical information, to change working practices, or to address professional culture.
Take Stock	Undertake some form of stocktaking initiative of existing learning modules. This would ensure that similar initiatives outside the BWC are not duplicated. Instead, they are drawn upon to facilitate the construction of a database using existing information by partnering or cross-referencing and, where necessary, complementing the resources to avoid duplication.[36]
Resourcing	Review the options for resourcing the learning module. This should include the provision of support for dedicated personnel or a group of experts to maintain the module and provide quality assurance and coherence to this part of the platform.
Promulgation and Uptake	Develop a promulgation and uptake strategy through regular promotion of the learning platform, including at events and meetings attended by end users. Additional ideas for disseminating materials could be through engagement with core textbook authors, universities or related educational associations.

[36] See section 0 of this publication for examples.

5. FORUM OF EXPERTS

The SecBio proposal calls for "a forum for expert's networking to exchange information, data and best practices". The forum is a valuable aspect of the proposal and can interface with – and build on – the repository and inform the learning module. This pillar is also perhaps the most challenging aspect of the proposal.

5.1 PAST EXPERIENCES AND LESSONS

Online expert forums are increasingly used in many fields as a tool for bringing together experts from across the globe (see box 3 for illustrative examples).

Box 3. Illustrative Examples of Expert Forums

WHO Horizon Scans

A recent set of studies carried out by the World Health Organization (WHO) relied on a group of experts deliberating and discussing sets of issues around the future of dual-use technologies and global public health.[37] The studies recruited groups of international experts to participate in a Delphi-style expert elicitation. To facilitate the exchanges, an online forum was opened with discussion threads on each topic under consideration. Participants were given several weeks to contribute to the discussion in the online forums. There were also two dedicated time slots to discuss issues live. During these two-hour "summits", participants were asked to actively contribute to the threads in real time. This process provided for rich discussion and exchanges, but also had drawbacks compared to face-to-face meetings, where discussion can be guided and steered towards consensus. This is an example of a time-limited forum with a specific objective that can be convened on an ad hoc basis.

European Expert Network on Terrorism Issues

The European Expert Network on Terrorism Issues (EENeT) is the result of an international symposium held by the German Federal Criminal Police Office (Bundeskriminalamt) in Wiesbaden in June 2007.[38] Participants recommended the continued sharing of experience and knowledge within the framework of an informal network. A survey among the participants established rules of procedure for the network, thereby formalizing the network and containing a provision for regular meetings. Its aims align with those of the SecBio forum proposal: establish a forum to facilitate networking between the authorities and disciplines relevant to this field of interest; create a forum-based discussion to critically examine respective professional positions; and provide a network to establish international partnerships and build relationships to perform international (research) projects and exchange experiences around a highly dynamic issue. Due to the sensitive nature of the

[37] World Health Organization, Emerging Technologies and Dual-use Concerns: A Horizon Scan for Global Public Health, 2021, https://apps.who.int/iris/handle/10665/346862; and World Health Organization, Emerging Trends and Technologies: A Horizon Scan for Global Public Health, 2022, https://apps.who.int/iris/handle/10665/352385.
[38] The EENeT information portal can be accessed at https://www.european-enet.org/EENeT/EN/Home/home_node.html.

subject matter, participation is selective to ensure a trusting exchange and the establishment of stable cooperative relationships. Membership is limited to those working for a European authority or a public college, university or established research institute in Europe. EENeT's membership counts more than 100 members from more than 20 European countries as well as several international organizations. A steering committee is tasked with coordinating the work plan of EENeT, which is established by members through voting.

Several lessons can be drawn from existing forums as well as related initiatives that have emerged particularly over the course of the Covid-19 pandemic. A key lesson is the need for online expert forums to create a **sustainable** online community, as activity can wane following a wave of initial enthusiasm. This can be particularly challenging without regular maintenance and moderation and when working with experts facing time constraints.[39]

A second lesson is the need to ensure suitable participation. Unrestricted participation enables **a plurality of voices** and diversity of views. Diversity is important in addressing a range of views on relevant aspects of biosafety and biosecurity and to minimize blind spots and groupthink, especially given the complexity of these issues. However, too many voices can create noise, leaving discussions unfocused, stifling exchanges and disrupting threads of conversation.

A third lesson derives from the assumption that the provision of an expert forum will elicit enlightened and purposeful contributions and that good advice and best practice models will crystalize organically following a discussion among the participants. This is not always the case, and discussions can be derailed, particularly in circumstances where expert forums are unmoderated or under-moderated. Considering this and the above point, some form of **facilitation** will therefore be needed to manage expert exchanges, particularly with diverse groups.

A fourth lesson for online forums, particularly those involving interdisciplinary participation, is recognizing and **reconciling competing and implicit assumptions** around particular topics, which can prejudice or skew the discussion.

5.2 OPTIONS FOR THE DEVELOPMENT OF THE EXPERT FORUM

The analysis above leads to several considerations for the development of the suggested SecBio expert forum, which are outlined in table 3.

[39] The WHO experience with online discussion forums identifies challenges posed by "restrictions on how much time individuals could commit to the exercise were unavoidable, given that the participants and contributors were in disciplines and professions in high demand during the pandemic". World Health Organization, Emerging Technologies and Dual-use Concerns: A Horizon Scan for Global Public Health, 2021, https://apps.who.int/iris/handle/10665/346862, p. 12. On maintenance and moderation see also D.R.P. de Lima et al., "What to expect, and how to improve online discussion forums: the instructors' perspective", Journal of Internet Services and Applications, vol. 10, article no. 22, 2019, https://doi.org/10.1186/s13174-019-0120-0.

TABLE 3. OPTIONS FOR THE DEVELOPMENT OF THE EXPERT FORUM

Organize an Initial Kick-off Meeting	A first step could be to organize and promote an international meeting or symposium. This could be similar to the experience of the EENeT or alternatively the forum could be launched on the sidelines of a BWC meeting. A physical meeting allows for selection of initial participants, provides a networking opportunity, and permits the exchange of information and accounting of the state of the art in biosecurity and biosafety to feed into the other aspects of the platform.
Sustainability	The EENeT example is instructive in how a network can be formalized and how resources can be mobilized from within the network. Regular meetings, a formal constitution with a work plan and a steering committee can further build a sustainable network of experts. There are, however, resource requirements for administration, such as admissions, conference organization and reporting.
Clear Objectives	The options for the expert forum should be connected to its aims. Three aims are proposed for SecBio: building a network of experts; exchange of data and information; and sharing of best practices. Exchange of information and best practices can be subsumed under the repository and the learning module to varying degrees. The expert forum could then become an area where interested parties discuss the information, the content of the repository and the learning module, and their administration and then build on them.
Participants	There is a need to further consider participation in the forum: What is the relevant expertise? How are experts to be selected or accredited to participate in the forum? To prevent intentional disruption in open threads, access might need to be selective. Various options are open to filter participation; however, this requires administrative effort and may require some criteria for participation. It will also require a strategy to recruitment new participants, particularly if the platform is indeed to become, as proposed, "the international reference on the issue" of biosecurity and biosafety.

6. REFLECTIONS

Biosecurity and biosafety issues are important to the realization of the objectives of the Biological Weapons Convention. The SecBio proposal presents a practical and useful step forwards to address a gap in biosafety and biosecurity and to contribute to the prevention of biological weapons.

Two issues that are recurring themes in the discussion above are critical to the successful realization of the proposal: resources and sustainability. The issue of sustainability needs to be considered from the start and actively built into the project. All of the examples cited above require sustained funding, dedicated assets and considerable expertise to realise. Indeed, the implementation and maintenance of the three pillars requires a substantial effort, even in their most basic form. Under-resourcing this initiative will inevitably result in fewer options being realized, or the quality of implementation suffering as a consequence.

Providing clarity on the objectives and end users of the different pillars could help with advancing the initiative. Several similar projects, albeit with slightly different aims and scope, are already underway. Some of these are mentioned here, many more are beyond the scope of this report. Proponents of the platform might usefully consider exploring partnerships or collaborations on cross-cutting themes, to exploit synergies and leverage existing efforts to avoid duplication.

SecBio is distinct from many other initiatives, and it could provide a critically important avenue to address geographical disparities in implementation, but also to ensure geographical representation at the design stages and in articulation of needs.

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