



Report: The Good, the Bad, and the Actionable: A Global Partnership Initiative to Counter and Leverage WMD Relevant Technologies

Monday 2 – Wednesday 4 June 2025

In partnership with
Global Affairs Canada

2025 President of the G7-
led Global Partnership
Against the Spread of
Weapons and Materials of
Mass Destruction (GP)



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Canada



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Executive Summary

The workshop convened leading experts from the weapons of mass destruction (WMD) non-proliferation and counter-terrorism community, technology companies and academia to comprehensively explore how rapid technological advancement and convergence are reshaping the WMD proliferation landscape. Recognising that existing efforts to address WMD-relevant technologies (WMD-RT) are often siloed, workshop participants highlighted the urgent need to build a more cohesive and enduring community of practice. The G7 Global Partnership Against the Spread of Weapons and Materials of Mass Destruction (GP) is uniquely positioned to bridge this gap by developing and delivering programming, fostering cross-disciplinary dialogue, engaging stakeholders from a range of sectors and geographies (including the Global South), and creating mechanisms for more robust government-industry collaboration (with both big tech and smaller industry partners). This in turn can form the foundation for a sustained process in developing a shared understanding of, and action-oriented approach for, WMD-RT risks and opportunities. The GP is ideally suited to develop practical applications focusing on both near-term opportunities and longer-term actions needed to counter threats, that move beyond traditional "trust but verify" approaches toward a more forward-leaning "verify then trust" paradigm, whereby the reliability of data, technologies and behaviours are completed before assumptions on compliance are made.

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Introduction

While the threats and opportunities posed by WMD-RT have long been recognised, little has been done to date to develop effective programmatic responses. In this context, as 2025 President of the G7-led [Global Partnership Against the Spread of Weapons and Materials of Mass Destruction](#) (GP), Canada is leading a sustained process to identify WMD Relevant Technologies that either support WMD non-proliferation and counter-terrorism efforts or present threats that the GP can counter. As part of that effort, this workshop explored how rapid technological advancements are re-shaping the WMD non-proliferation landscape and aimed to identify not only new challenges but also opportunities to effectively mitigate evolving threats. Over three days, stakeholders from the chemical, biological, radiological and nuclear (CBRN) segments of the WMD non-proliferation community convened with experts from WMD-relevant technology (WMD-RT) sectors, including artificial intelligence (AI), additive manufacturing (AM), quantum technologies, and synthetic biology. By facilitating information sharing and cross-disciplinary dialogue between WMD non-proliferation specialists and private sector technologists, the workshop sought to compile actionable programmatic recommendations for the 31 members of the Global Partnership. Discussions revolved around three main themes: building an enduring community of practice focused on WMD-RT, framing the objectives of this community, and sketching initial outlines of practical applications.

I. Building an Integrated and Enduring WMD-RT Community of Practice

The accelerating speed of technological advancement and the increasing convergence between diverse tech sectors, alongside the broad range of potential applications, necessitate continuous and integrated evaluation of implications for WMD non-proliferation. Different segments of the WMD non-proliferation and counter-terrorism community possess varying levels of awareness regarding the state of the art in different technological sectors. International organisations are already employing various mechanisms to remain informed about technologies that could support their work or necessitate globally coordinated guidelines. For instance, the International Atomic Energy Agency (IAEA) has convened several Emerging Technology Workshops to explore potential applications of advanced technologies, such as distributed ledger technology and artificial intelligence, to its nuclear safeguards. Similarly, in recognition of the accelerating pace of convergence and application of AI-enabled synthetic biology, an Expert Advisory Committee of the World Health Organisation (WHO) issued recommendations and a [Framework for](#)

[Governance on human genome editing](#). More broadly, WHO published the [Global Guidance Framework for the Responsible Use of the Life Sciences](#) in 2022. The Scientific Advisory Board of the Organisation for the Prohibition of Chemical Weapons (OPCW) annually scans the technological horizon, reporting on developments relevant to preventing the re-emergence of chemical weapons.

Furthermore, meetings of the Global Partnership Working Group (GPWG) have consistently considered WMD proliferation threats and non-proliferation opportunities arising from disruptive technologies, with member governments investing in technological solutions to specific challenges. Examples include the [Monitoring and Tracking Chemicals](#) (MATCH) project, which has demonstrated the potential of distributed ledger technology (DLT) to streamline declarations of international dual-use chemical transfers, and INTERPOL's [BioTracker](#), which leverages big data and machine learning for early warning of biological threats. The [BioPrevail](#) initiative also incentivises industry to leverage innovative technology to develop new solutions to enhance the sustainability of high-containment biological laboratories in resource-constrained settings.

However, these efforts have largely been siloed, opportunistic and/or ad hoc. Moreover, many governments in the Global South remain on the sidelines of these discussions and risk benefiting only partially from these powerful new technologies, or worse, experiencing political, economic, and social exploitation and instability. Meanwhile, research scientists, applied technologists, and small and mid-sized technology firms often lack awareness of how their inventions and technological advancements could enable malign actors to acquire or proliferate CBRN weapons, or conversely, how they could strengthen WMD non-proliferation regimes and counter-terrorism efforts. While leading artificial intelligence firms invest in responsible AI initiatives and embed guardrails in large language models, smaller start-ups may not possess the same level of awareness regarding vulnerabilities. Open-source cyber defense tools like "hackathons" may be beneficial for traditional cybersecurity but are not well-suited for identifying and mitigating CBRN vulnerabilities in new technologies. Instead, more specialised and controlled approaches are needed to safely and effectively uncover potential risks without inadvertently creating new ones.

In this context, there is a clear opportunity for the Global Partnership to leverage its significant multilateral influence and proven threat reduction track-record to reinforce and expand existing work within the IAEA, WHO, OPCW, INTERPOL and other international and multilateral organisations. The Global Partnership could signal the

critical importance of WMD-RT by submitting open letters to relevant entities with questions on new technologies and could sponsor side events on WMD-RT at meetings or conferences of states parties to the relevant Conventions. Sustained effort to build mutual understanding and trust over time will be foundational to identifying shared problems and aspirations and implementing threat-agnostic and technology-agnostic approaches to both mitigating proliferation risks and leveraging proliferation prevention benefits of WMD-RT. This trust- and community-building process could benefit from lessons learned from previous efforts to integrate new stakeholders, such as public health practitioners and law enforcement specialists, into the WMD non-proliferation community of practice, with staff secondments proving fruitful.

To achieve this, a first critical step is to map, build, engage, and sustain a networked collaboration between government and industry by:

- **Coordinated stakeholder and platform mapping.** Mapping academic institutions, private companies, NGOs, and governments globally whose work or interests intersect with the WMD non-proliferation and counter-terrorism mission space. This effort could include a platform mapping exercise to identify relevant interlocutor networks best suited for engaging these communities, such as Chambers of Commerce, accelerators, venture networks, and intergovernmental discussion forums. While the first three are largely outside of the scope of the GP, their mapping will help outline areas where others can engage. The mapping exercise will also address the information asymmetry between government and industry and acknowledge that industry is not a monolithic entity, requiring processes that allow for smaller players to engage, as these often operate at the frontlines of commercialisation but have limited resources for engagement.
- **Constituency building and education.** Educating target constituencies through learning networks, tailored to each group. For example, the GP could lead outreach to the younger generation of technology innovators through targeted awareness-raising operations on dual-use concerns and WMD literacy, akin to previous educational outreach to engage bioscience students on the ethics and dangers of bio-proliferation. The FBI's workshops with "do-it-yourself laboratories" and industry's "creativity labs" offer models. The WHO Academy's online dual-use research of concern (DURC) courses and the UN Office for Disarmament Affairs (UNODA) Erlangen Initiative for outreach to

academia on export controls and research of concern also provide platforms that could be built upon. Opportunities also exist to connect the G7 to the G20, expanding this critical agenda to a broader constituency, including countries of the Global South.

The GP offers a vital forum for information sharing across sectors and can facilitate the clearer articulation of WMD threat reduction priorities. Additionally, sponsoring side events focused on WMD-RT at meetings or conferences of relevant conventions can help raise awareness and drive engagement across the policymaking community. There is also an opportunity to better combine resources across GP partners, starting within the G7. Given the lack of regular conversations between the security sector and the private sector, the GP can convene stakeholders for dialogue, focusing on problem identification. This includes creating an "aggregated view" of issues and solutions and encouraging convenings across WMD-relevant conventions and multilateral regimes to discuss and promote solutions with diplomats, scientists, technologists, and NGOs, considering "ecosystems" rather than isolated "sectors."

II. Developing Shared Awareness and Risk Management

Once established, a key objective of the new Global Partnership WMD-RT Community of Practice would be to sustain a multi-disciplinary and multi-sectoral process to identify, review, and prioritise new technology-based capacities to prevent, detect, deter, and investigate the acquisition of WMD. A foundational element of this process should be a regular, if not continuous, horizon scanning effort to help government and civil society stakeholders stay abreast of technological advances in key tech sectors. Crucially, the horizon scanning and information sharing process must also ensure that the private sector at all levels - from DIY to academia, start-ups, mid-sized companies, and global tech titans - possesses a clear, high-level picture of the dynamic and evolving spectrum of WMD proliferators and proliferation risks. Tight time scales are recognised as a significant issue in this rapidly evolving environment, emphasising the need for more focus on AI safety rather than just AI models.

Results from the ongoing horizon scanning process should directly inform an objective, science-based, and GP-wide risk assessment and risk management framework. Given increasing demands on limited time and resources, particularly for Global South partners, a common risk identification and management framework would be beneficial in prioritising problem sets and ensuring the most efficient use of limited capacities. A two-tiered risk framework would be effective, encompassing a GP risk

assessment framework outlining areas of focus for the GP, and a framework for working with technology partners on their risk assessments while including regional partners and international organisations to facilitate the rollout of such frameworks.

Scenario-based exercises, including red/blue teaming, are a well-tested and promising methodology for integrating diverse stakeholders around a common horizon scanning, information sharing, and risk analysis framework. Such exercises help elevate strategic thinking, enhance operational preparedness, and can be highly compelling in propelling policy action. Approaches can vary, from anonymising real-world incidents to developing plausible future scenarios based on current trends. For example, a question like, "How will CBRN weapons and related materials be proliferated in 5 to 10 years?" could guide the development of detailed scenarios illustrating the impact of different WMD-RTs on proliferation pathways for various threat agents. Tabletop or field exercises could then address these scenarios, tailored to regional contexts, including the Global South.

III. Prioritising Practical Applications and Solutions

The GP is uniquely positioned to drive practical cooperation on near-term actions such as advancing countermeasures and promoting responsible use of technology. It could draw on the WMD-RT Community of Practice's horizon scanning, risk assessment, and scenario building work to identify critical areas where it can play a catalytic role in advancing next-generation tools to prevent the deliberate misuse of CBRN materials and technology. In this way, it can encourage a move from traditional "trust but verify" compliance approaches involving data toward a more forward-leaning "verify then trust" paradigm. In doing so, the GP can help shape a more resilient and secure global system by supporting the responsible deployment of novel tools, reinforcing data and supply chain integrity, enhancing detection and verification capabilities, and fostering collaboration across sectors and borders.

Immediate Targets of Opportunity

- WMD-RT Analysis and Programmatic Responses: Launch and lead a sustained multi-disciplinary and multi-sectoral process to identify, prioritise, develop and deliver new technology-based capacities and capabilities to prevent, detect and investigate the acquisition and/or use of CBRN weapons.
 - Adopt GP principles on responsible technology development and use across CBRN, potentially through developing simple, universally applicable guidelines, sometimes referred to as “simple robot rules.”
- WMD-RT Risk Assessments: Develop a GP risk assessment framework for WMD-RT and support partners to develop and implement national, regional and/or global WMD-RT risk assessments and action plans.
- Awareness Raising: Raise awareness of WMD-RT threats and opportunities within WMD conventions and relevant international instruments and international organisations by submitting open letters from the GP to highlight critical questions on emerging WMD-related technologies, with a view to reinforcing and strengthening WMD-RT efforts within multilateral mechanisms.
- Medical Mitigation/Countermeasures (MCM)? Vaccines, therapeutics, and antidotes are essential tools in deterring and mitigating the impacts of both biological and chemical weapons, as they can deny attackers the ability to cause mass harm. While most vaccine and MCM research and development (R&D) efforts fall outside the GP remit, the accelerated pace of vaccine R&D (enabled by advances in synthetic biology and AI) and similar breakthroughs in chemical synthesis (particularly when combined with AI) may present discrete opportunities for GP engagement to support “deterrence by denial”.
- Unmanned Aerial Vehicles (UAV): Assess the GP-related threats and opportunities posed by UAVs, with a view to identifying and supporting programming to enhance CBRN non-proliferation and counter-terrorism efforts (e.g. surveillance, WMD investigations, sample collection).

Other Opportunities for Tool Development

- Secure and account for CBRN Materials & disrupt proliferation pathways by implementing layered, redundant detection systems; improve transparency through enhanced import/export data reporting and develop solutions to ensure the reliability and security of data and critical infrastructure.
- Maintain appropriate and effective measures to prevent, detect, and disrupt the deliberate misuse of CBRN materials by monitoring and anticipating evolving methods of attack and evaluating, training and monitoring AI models to ensure the safe and secure use of AI for CBRN.
- Strengthen national and international capabilities to rapidly identify, confirm/assess, and respond to WMD-related threats by leveraging AI for enhanced diagnostics and early detection, advancing forensic tools and laboratory capacities for credible attribution, improving information-sharing platforms for trend analysis and risk reporting, and developing programs to address insider threats.

The GP can focus on clarifying priorities, with partners and members identifying their priorities. Needs assessments could be provided by academic institutions to avoid government classification concerns, though care would be required to avoid inadvertent proliferation. The GP can also generate problem or challenge statements for industry to solve. NATO's Defence Innovation Accelerator for the North Atlantic (DIANA) provides an excellent model in this regard by focusing on technology-agnostic problem statements. The DIANA accelerator program, for example, generated significant interest from companies seeking to provide next gen solutions, leading to procurement and investment and demonstrating a viable plan for advancing technology. The quantum sector could serve as a "guinea pig" for this approach. The AI safety institutes, designed to compel companies to share information with government, highlight the need for significant thought and effort in the more diffuse AI space. Critically, these discussions would acknowledge that "AI is not programming itself," and the people in the loop need to be aware of potential risks.

Conclusion

The Global Partnership - working in collaboration with other sectors, organisations and entities - has several opportunities to translate these insights into concrete action. By actively building and sustaining a collaborative WMD-RT community, cultivating shared

awareness and robust risk management frameworks, and prioritising the practical development and deployment of next-generation solutions, the GP can clarify priorities, generate problem statements for industry, and align incentives. This strategic approach will not only reinforce existing international instruments but also proactively shape a more adaptive, resilient, and secure global system capable of staying ahead of evolving WMD threats, fostering a crucial "verify then trust" paradigm for the future of non-proliferation.

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