United Nations A/79/240

General Assembly

Distr.: General
24 July 2024

Original: English

Seventy-ninth session
Item 100 of the provisional agenda*
Review of the implementation of the recommendations and decisions adopted by the General Assembly at its tenth special session

Work of the Advisory Board on Disarmament Matters

Report of the Secretary-General

Summary

In response to an ever-evolving global landscape, the Secretary-General requested the Advisory Board on Disarmament Matters to conduct a strategic foresight exercise over the course of 2024 and 2025 to identify present and future international peace and security risks and opportunities emanating from advances in science and technology in the period leading up to the centenary of the United Nations in 2045.

The Secretary-General tasked the Board with several objectives: identifying and analysing emerging peace and security trends, exploring interactions between technology and weapon systems, assessing impacts and governance mechanisms and proposing measures to address risks and opportunities.

Now at the midway point in its discussions, the Board has highlighted a growing need within the United Nations for a systematic analysis of how scientific and technological advances intersect with disarmament and arms control issues. The Board has recognized the intricate and cross-disciplinary nature of its mandate, highlighting the varied drivers and effects of technological and scientific advancements and their potential to either enhance disarmament, development, peacebuilding and the protection of human rights or exacerbate inequalities and conflict dynamics. Moreover, it is cognizant of its unique position within the disarmament machinery to comprehensively consider this topic of timely importance.

Key areas of concern included defining and ensuring human control over artificial intelligence (AI) and autonomous weapons, compliance with international law, understanding the roles of various stakeholders including States and non-State actors (private sector, civil society, the scientific community and non-State armed groups) and the interactions of technological advancements with existing weapon types, and anticipating the implications for the disarmament and arms control agenda,

* A/79/150.

efforts and machinery. Overall, the Board has underscored the need to navigate global technological developments responsibly and enhance international peace and security frameworks.

The Board considered several promising potential areas for action, which it will continue to examine and refine during the next 12 months for presentation to the General Assembly in its 2025 report.

In its capacity as the Board of Trustees of the United Nations Institute for Disarmament Research (UNIDIR), the Board reviewed the current programmes, activities and finances of UNIDIR, including ongoing efforts to strengthen its policy impact, achieve financial sustainability and further expand its global engagement. The Board was briefed on several UNIDIR workstreams, including on the implications of AI for international peace and security, on new developments in the domain of space security and on the objectives and planned activities for its Middle East Weapons of Mass Destruction-Free Zone Project. Trustees discussed recent activities such as Security Council briefings on cybersecurity and small arms, capacity-building initiatives in AI ethics and international law, and improvements to strategic and global communications. The Board endorsed plans for the programme of work and budget of UNIDIR for 2025, emphasizing core research areas and the need for sustainable funding to support the Institute’s vital research functions amid evolving global challenges.

I. Introduction

1. The Advisory Board on Disarmament Matters held its eighty-first session from 31 January to 2 February 2024 in Geneva. The Board held its eighty-second session at United Nations Headquarters in New York from 26 to 28 June. Shorna-Kay Richards (Jamaica) presided as Chair of the Board for both sessions.

2. The present report is submitted pursuant to General Assembly resolution 38/183 (O). It contains a summary of key considerations to date. The final recommendations of the Board will be presented to the Secretary-General following its eighty-fourth session in June 2025. The report of the Director of the United Nations Institute for Disarmament Research (UNIDIR) was approved by the Advisory Board, in its capacity as the Institute's Board of Trustees, and has been submitted in document A/79/146.

3. Over the course of its eighty-first and eighty-second sessions, the Advisory Board began a two-year programme of work focused on international peace and security risks emanating from advances in science and technology. Specifically, the Secretary-General asked the Board to:

- Identify and analyse relevant peace and security trends emanating from advances in science and technology, associated risks and opportunities
- Explore the interaction between these advances in science and technology and weapon systems
- Identify possible impacts and cascading effects
- Identify governance mechanisms and specific measures to respond to these risks and opportunities

4. In his policy brief entitled "A New Agenda for Peace",[1] the Secretary-General called for preventing the weaponization of new domains and technologies and ensuring the peaceful and responsible use of technological advances. Indeed, addressing risks emanating from new domains such as cyberspace and outer space, as well as from technologies such as artificial intelligence (AI) and autonomy, is a key priority given the potential for such developments to affect human lives by transforming the nature of conflict and warfare.

5. The United Nations already serves as a platform for discussing various technological developments affecting peace and security. Most prominent among them are the Group of Governmental Experts on lethal autonomous weapons systems, the open-ended working group on security of and in the use of information and communications technologies 2021–2025 and the Group of Governmental Experts on Further Practical Measures for the Prevention of an Arms Race in Outer Space.[2] States parties to the Chemical Weapons Convention, the Biological Weapons Convention and the Conference on Disarmament are also discussing this within their respective mandates. Moreover, the Disarmament Commission has agreed to consider an agenda item entitled "Recommendations on common understandings related to emerging technologies in the context of international security" during its 2024–2026 triennial cycle, which presents an opportunity for Member States to consider cross-cutting issues applicable to emerging technologies, as well as to consider those emerging technologies that have implications for international security but are not currently discussed in dedicated United Nations processes. Moreover, within several treaty frameworks, States are increasingly considering the impacts of developments in science and technology on existing weapon types, for example within the context of

[1] United Nations, "A New Agenda for Peace", policy brief 9, July 2023.

[2] See https://meetings.unoda.org/.

the Biological Weapons Convention and the Programme of Action on Small Arms. At the same time, discussions within the United Nations on the application of AI to the military domain have not yet taken shape.

6. Amid the growing concerns about the unknown impact of advancements in science and technology, and in the light of the increasing role of foresight tools as methods for developing a forward-thinking culture for better United Nations system impact, the Secretary-General asked the Board to structure its approach to the topic as a strategic foresight exercise.[3] The aim of such an exercise would be to produce an overview of the most salient advances in science and technology in the context of international security, assess their impact on disarmament, arms control and non-proliferation and identify possible measures to meaningfully address, mitigate and prevent risks, as well as seize on opportunities.[4] Considering the period to 2045, the year in which the United Nations turns one hundred years old, Board members were asked to consider what they believed to be the main issues when thinking about advances to science and technology over the next 20 years.

7. In a video message to the Board at its eighty-second session, the Secretary-General emphasized the potential benefits and dangers of scientific and technological developments for international peace and security, stressing the importance of addressing their risks, in particular in relation to weapons and the means and methods of warfare. Highlighting concerns about lethal autonomous weapons systems, the weaponization of outer space, cyberthreats to critical infrastructure, three-dimensional printing technologies that could spur the proliferation of small arms and light weapons, and the integration of AI into military systems, the Secretary-General requested the Board to consider proactive measures to prevent the misuse of technology, advocate peaceful applications and ensure responsible governance and governance structures. Moreover, the Secretary-General noted that the work of the Board could meaningfully feed into the Summit of the Future to be held in September 2024, which presented an opportunity for the world to identify solutions for the use and governance of technology, including breakthroughs such as AI in the context of peace and security.

[3] Strategic foresight can best be described as a structured method that helps to navigate uncertainty, imagine better futures and chart new paths forward. It is not about predicting the future but rather about understanding potential, probable and preferable futures to inform current actions. Strategic foresight is increasingly being integrated into United Nations decision-making and programming to help navigate the complexities of the twenty-first century.

[4] To achieve the objectives outlined above, the United Nations Institute for Disarmament Research (UNIDIR), together with the Office for Disarmament Affairs, developed a tailored methodology. Upon assessing and weighing the advantages and disadvantages of the various foresight methodologies that exist, it was decided that an exercise centred on “futures wheels” would best serve the Board’s goals. The futures wheel, also known as the implications wheel, enables a systematic exploration of possible future impacts by considering a wide variety of critical changes that are on the horizon. It uses structured brainstorming and visualization to explore the direct and indirect (first, second and third order impacts) of a trend or event. An important element of this method is that it recognizes that each seed of change triggers or generates a cascade of impacts – direct and indirect, positive and negative – that can continue ad infinitum. The “futures wheel” approach ultimately produces an overview of the strategic and policy implications of identified trends related to science and technology, as well as a mapping of possible solutions to maximize positive returns and mitigate negative outcomes.

II. Substantive discussions

A. Context and background

8. The international peace and security landscape is increasingly shaped by advances in science and technology. These developments are not only transforming economies and societies but also significantly influencing strategies and approaches in disarmament, arms control and non-proliferation efforts. The international security environment remains tense and complex, characterized by a deficit of trust among States and new challenges to global governance posed by both traditional and emerging threats. Persistent conflicts, regional instabilities, organized crime, the threat of weapons of mass destruction and the scourge of illicit small arms and light weapons continue to pose significant challenges for global peace and security, as well as for the achievement of the Sustainable Development Goals.

9. Mindful of its timely and strategic importance, the Advisory Board welcomed the opportunity to reflect in a sustained manner on the topic of advances in science and technology and their implications for peace, security and disarmament over the next two years, with a view to offering a set of specific recommendations in response to the Secretary-General's request. The Board recognized that it was faced with a formidable task given the subject's multifaceted and interdisciplinary nature, the many unknowns related to ever-evolving scientific and technological innovations, and the nature of rapid changes in technological developments and their applications in conflict situations.

10. At the outset, the Board noted that certain technological advances held the promise of transformative benefits for the global community, in particular in developing countries. When harnessed for good, such advances could help to enhance living standards and foster economic growth and social development worldwide, promoting a more equitable and interconnected global society. Acknowledging the significance of peaceful uses of emerging technologies for developmental purposes, the Board noted the need for a balanced approach to innovation and regulation.

11. At the same time, Board members believed that the international community must confront the risks to global peace and security. They noted that recent advances in technologies such as commercial cyberintrusion capabilities, AI-enabled military systems and the production of small arms and light weapons using illicit additive manufacturing technologies were already causing severe harm to individuals, affecting various regions and disproportionately affecting vulnerable groups. That impact was particularly pronounced in situations of armed conflict but also extended to people's social and economic well-being in non-conflict settings, as some technological developments could have adverse environmental consequences or widen income gaps. The Board emphasized the need to consider those already apparent consequences and ways to ensure accountability in its foresight discussions. In addition, members stressed the importance of acknowledging the responsibility of humans throughout the life cycle of emerging technologies to foster innovation that benefited the common good rather than creating harm or exacerbating existing inequalities.

12. The Board resolved to identify constructive ideas about: (a) the most pressing relevant peace and security trends emanating from advances in science and technology; (b) mechanisms and tools to address associated governance gaps and challenges to ensure responsible and accountable technological advances; and (c) the role and added value of the United Nations disarmament machinery and agenda in meaningfully and effectively anticipating and proactively responding to those changes.

B. Scoping of challenges and opportunities

Scanning the horizon

13. Considering a 2045 timeframe, the Board performed an initial mapping of current and future developments in science and technology of relevance to weapons and the means or methods of warfare.[5] Several critical factors were identified from the discussions and expert presentations from an external speaker and Board members.

14. A pivotal consideration was the rapid evolution and convergence of emerging technologies, which are already reshaping military landscapes globally. In the Board's assessment, these technologies span, inter alia:

- Digital technologies
  - Information and communications technology
  - Quantum technologies
  - AI
- Autonomy
- Data science
- Biotechnology
- Space and aerospace technologies
- Materials technologies
  - Additive manufacturing of small arms, including the use of non-traditional materials[6]

15. The foresight exercise was designed so that Board members examined relevant trends, which covered issues that align with the Secretary-General's priorities as outlined in his policy brief on A New Agenda for Peace and where there is a real need for multilateral approaches and solutions. The trends included increased reliance on digital technologies and data; the evolving role of non-State actors and their relationship with States in technology development, governance and use; increased convergence of emerging technologies and domains of application; increased diffusion of technology and competition to gain a technological advantage; and the weaponization, malicious uses and proliferation risks of emerging technologies. The Board discussed their impact on three different areas in depth, namely: (a) conflict, peace and security; (a) disarmament and arms control (the disarmament machinery); and (c) the disarmament, development and human rights nexus. In so doing, Board members identified the following four guiding questions:

- What types of technology developments should be considered?
- Who are the different types of actors, and what role will they each play?
- Why will different types of actors pursue technological developments, adoption, deployment and/or governance?

[5] In this regard, the Board noted the Secretary-General's 2023 report on this subject (A/78/268) and agreed that further in-depth discussions on those and other technologies, such as cybersecurity, space, AI and quantum computing technologies as well as advances in additive manufacturing and material sciences and the synthesis between biology and chemistry, would be needed at its future sessions.

[6] For example, polymers, the use of three-dimensional printing, and modularity in weapon design.

- How will science and technology developments practically influence the international peace and security ecosystem?

16. The above guiding questions served as broad areas of focus and as a starting point for further debate on trends and on the scoping of impacts, associated risks and opportunities on conflict, peace and security, disarmament, and human rights and sustainable development. The key impacts that emerged from the Board's discussions, which are now at their midway point, are summarized below.

17. Board members remarked on several occasions that many technologies could be used for good or ill, depending on motivations, circumstances and applications. By extension, the Board cautioned against taking a deterministic approach to advances in science and technology. Rather, it noted that the evolution of technology was a social process that depended on the skills and knowledge of particular combinations of actors, whether technology was developed in military or civilian contexts, whether the development involved national military forces or non-State actors, advanced industry or local workshops, and how techniques and artefacts were diffused.

Initial analysis of risks and opportunities for conflict, peace and security

18. Board members signalled that technological developments held the potential to dramatically alter how wars were fought, with a high degree of unpredictability as to their impact, including their interactions with existing weapons, specifically nuclear weapons. Taking the 2045 timeframe, they envisioned an increase in asymmetric conflict, an ever-increasing reliance on autonomous and automated technologies in conflict, and the advent of (generative) AI in the military domain.

19. At the same time, the Board noted that various technological applications were currently being designed, developed and deployed by militaries, as well as non-State actors, and used in various conflicts around the world. That included cybercapabilities that enabled actors to conduct disruptive and destructive operations against critical infrastructure, data and communications systems, AI-enabled target identification systems, the use of polymers, the use of three-dimensional printing, and modularity in small arms and light weapon design, which fuelled the illicit proliferation of those weapons, enabling armed violence. In addition, cryptocurrencies facilitated the evasion of international financial control mechanisms, which enabled non-State actors to fund their operations or States to avoid international sanctions.

20. The Board warned that conflicts and transnational issues of grave concern such as terrorism and organized crime would continue to be fuelled by conventional weapons, small arms and light weapons, which were increasingly developed using emerging technologies in particular. The Board also discussed "vernacular" technologies involving easily available resources and customized technologies, including military technologies, such as craft-produced weapons, commercial cyberintrusion capabilities, improvised explosive devices made from fertilizers and triggered by mobile phones, or commercially available uncrewed aerial vehicles (commonly referred to as drones) armed with explosives, which could have a devasting effect on larger pieces of military equipment as well as individuals. Those were only a few examples, the number of which might multiply severalfold in the future. The Board noted that easier access to such commercially available or vernacular technologies could offset supposed asymmetries.

21. The Board assessed how some key aspects of emerging technologies such as autonomy could ease intensive military functions such as logistics, staff duties, communications and infantry sentry roles, noting that there might be some benefits to technological advances in weapon systems. At the same time, Board members debated the assumption that technological advancement would lead to "better warfare" or military success due to the changed and asymmetric nature of present-

day wars. Board members questioned the assumption that emerging technological advances were a panacea for various military needs. Consequently, such thinking might spark an arms race, which would be further fuelled by the massive investments made by private industry in their quest for global markets, haste in using weapons not adequately tested for reliability, safety or appropriateness for national military doctrines, and an inclination to downplay the human costs of modern conflicts, with the risk of affecting groups in vulnerable situations and regions unequally. The Board cautioned that automation bias might also develop because the reliance on technology could diminish critical thinking and oversight, with important details or alternative solutions potentially overlooked. The Board emphasized that emerging technologies might change the reasoning behind warfare, making it easier for wars to be started and to escalate quickly while also making wars more difficult to end.

22. Discussions also underscored the dynamic nature of technological development, shaped by supply-demand dynamics and historical contexts of the adoption of technologies in conflict scenarios. This included instances in which civilian technologies such as uncrewed aerial vehicles were widely used during conflicts such as those in Afghanistan, Gaza and Ukraine. Equally, members pointed out that the lead in developing technologies shifted between civilian and military entities, driven by changes in resources and incentive structures, such as peacetime versus wartime situations.

23. The Board reflected on the need to adequately define the concept and practical implementation of human control, as well as the need for human-centred approaches to science and technology. It discussed how notions of "human control" might change as a result of the adoption of various technologies and reliance on data provided by machines, with an impact on the human willingness and cognitive ability to assume responsibility. Equally, it stated that, as a principle, the standard of what constituted human control must be guided by relevant international law norms and ethics. With system operators being further and further removed from the battlefield through the use of technology, including increased autonomy, the Board flagged the risk of greater "dehumanization" of people caught up in armed conflict. Moreover, the dual-use nature of these technologies complicated matters further, as innovations intended for civilian purposes often found their way into military applications, blurring the lines between peaceful and potentially disruptive uses.

24. Board members discussed the pivotal role of data in the digital technology revolution, emphasizing the profound influence of data in determining where knowledge and power were located, with a multiplicative effect. This point was further unpacked by Board member Jean-Marie Guéhenno, who, in his dedicated presentation,[7] assessed how the proliferation and reliance on data might transform conflict, noting that increasing data transparency had both positive (enhanced prevention and humanitarian response capabilities) and negative (from vulnerability to exploitation) implications. The blurring line between civilian and military targets further complicated warfare tactics, exacerbated by the impact of disinformation and authoritarian measures. Furthermore, throughout the life cycle of emerging technologies, reliance on data, in particular personal data, raised critical issues of data appropriation, data colonization and privatization that could lead to violations of fundamental human rights.

25. Members noted that the private sector was largely driving technological and scientific developments, which raised questions about companies becoming increasingly involved in battlefield operations, as had already been the case in certain ongoing conflicts, and about their potentially outsized role in influencing government policy on technological developments. In that connection, they saw a role for the

[7] A full summary of the presentation is included in annex I.

private sector, including researchers, scientists and civil society actors, to be involved in bottom-up lawmaking and norm-building in an effort to put effective governance systems in place.

Initial analysis of risks and opportunities for disarmament, arms control and non-proliferation

26. Addressing the positive and negative implications of emerging technologies on disarmament, arms control and non-proliferation, the Board examined a broad set of issues, including how advances in science and technology exacerbated existing risks and created new ones, the growing interconnectedness among various technological domains, and how rapid advances in science and technology could contribute to the escalation or de-escalation of crises. Board members noted that the impact of emerging technologies on disarmament, arms control and non-proliferation should be assessed in the broader context of interlinkages with the maintenance of international peace and security and the promotion of the developmental and humanitarian agenda on the basis of international cooperation and dialogue.

27. The Board devoted considerable time to exploring developments related to military AI, noting that, at present, no dedicated discussions on that topic were ongoing within the United Nations. In her presentation on the issue, Board member Jina Kim outlined the way in which the military AI market was growing, driven by increased investment, with militaries of leading countries expanding spending in that field, with the trend expected to continue owing to its potential benefits.[8] In that connection, Board members considered the potential positive impact of military applications of AI, which might include enhanced intelligence, real-time target investigation, the neutralization of cyberincidents, and reduced maintenance costs. It could also facilitate non-compliance recognition and reliable monitoring and mitigate vulnerabilities in arms export control.

28. At the same time, members discussed how AI deployment in military contexts could pose significant challenges. It might encourage riskier behaviour and reinforce the trend in blurring the distinction between war and peace and between civilians and the military. It might also alter the reasoning behind engaging in warfare owing to automation bias and the emphasis on speed in decision-making, potentially exacerbating trust deficits and susceptibility to data poisoning attacks and leading to conflicts, and even permanent wars, in unanticipated ways.

29. Crucially, members noted that a lack of or challenges to governance in various areas, including with respect to military AI, meant that the international community was lacking a shared understanding of and response to the risks posed for peace and security more broadly, and disarmament and arms control efforts specifically. They discussed the need to ensure accountability, transparency and impartiality in AI systems through adaptive governance while acknowledging the challenges. The latter included the intangible and fast-changing nature of the technology, the global availability of the human expertise and material resources capable of repurposing AI, and the fact that AI research and development was currently concentrated in a small number of States and primarily private sector actors. Moreover, regulatory efforts were complicated by the dual-use nature of AI and its widespread civilian applications, raising further challenges in enforcement and compliance.

30. In that connection, Board members pointed out a distinct knowledge and awareness gap among policymakers, civil society and the general public about quickly evolving AI technologies and their applications in military contexts, which could outpace public awareness and understanding and might not be widely discussed

[8] A full summary of the presentation is included in annex I.

or understood outside specialized circles. Addressing those knowledge gaps required efforts to evolve an understanding of the categorization of risks and to enhance transparency in military AI practices, facilitate informed public debate through education and engagement and promote ethical frameworks and regulations that governed AI applications in military settings. That could help to bridge the divide between technological advances and public understanding, ensuring that AI in military applications was used responsibly and ethically.

31. The Board also noted that advances in biotechnology offered promising scientific advances and potential risks in the realm of biological weapon proliferation. Advances in biotechnology, including genetic engineering and synthetic biology, had dual-use potential for medical breakthroughs and biowarfare capabilities. The dual-use nature of biotechnological research underscored the importance of robust international frameworks and regulations to prevent misuse and ensure peaceful applications. In addition, given that civilian activities were increasingly dependent on space-based systems, the Board believed that the militarization of outer space introduced new threats with potentially devastating consequences, intensifying competition and potential conflicts in orbit.

32. In the area of robotics and autonomous weapons, members discussed the potential benefits of robotics technology (for example, in aiding mine clearance) while noting a pressing need to put in place guardrails around lethal autonomous weapons systems. They underscored that, without comprehensive multilateral regulations, the creation, design, development and use of these systems raised humanitarian, legal, security and ethical concerns and posed a direct threat to human rights and fundamental freedoms. It recalled the Secretary-General's position that machines with the power and discretion to take lives without human involvement were "morally repugnant and politically unacceptable" and should be prohibited under international law.

33. Beyond scrutinizing individual emerging technologies, the Board was seized of the urgency of addressing their interplay and interconnectedness with existing weapon systems. This was emphasized by Board member D. B. Venkatesh Varma, who prepared a "food-for-thought" paper in support of the Board's discussions. In the paper, he underscored, among other things, the need not only to examine those individual technologies but also to analyse their interaction.[9]. In that connection, Board members noted that the following areas of interaction posed particular concerns:

- AI and autonomous weapon systems
- AI and life sciences
- Information and communications technologies (ICTs), AI and outer space
- ICTs, AI and nuclear-weapon systems

Such convergences not only enhanced the lethality of military capabilities but also presented significant regulatory challenges owing to their uneven and largely unregulated development across national borders. That trend was exacerbated by the rapid pace of technological development, which outstripped the ability of existing regulatory frameworks to keep pace, leading to concerns about strategic surprise.

34. Board members discussed how the convergence of, for example, AI and nuclear weapons could create destabilizing conditions under which States could feel compelled to use nuclear weapons first, leading to rapid and uncontrolled escalation. Members were alarmed at the notion of integrating AI into nuclear command, control

[9] The full summary of the paper is included in annex I.

and communications, which could lead to compressed time frames for decision-making, with the speed of AI-enabled actions capable of outpacing human capacity, resulting in the potential for miscalculation and escalation during crises. Additional concerns centred on data poisoning and "black box" decision-making, which had implications for conventional command and control within militaries.

35. Board members Rose Gottemoeller and Anton Khlopkov further examined how advances in science and technology exacerbated existing strategic risks and created new ones.[10] Ms. Gottemoeller posited that the introduction of artificial general intelligence was emerging as a pivotal concern, as it could introduce unpredictability, posing new risks of unintended escalation and undermining traditional deterrence strategies reliant on predictability. Mr. Khlopkov underlined that, in an increasingly complicated landscape, emerging technologies such as AI, quantum technologies and hypersonic weapons presented dual-use capabilities that could either stabilize or destabilize international security. For instance, AI could optimize military operations and enhance early warning systems, yet its misuse could escalate conflicts or increase vulnerabilities in strategic systems.

36. The Board also conducted a preliminary exploration of potentially positive implications of science and technology developments for disarmament, arms control and non-proliferation. For instance, with regard to nuclear disarmament, members touched on the possibility of AI or satellite imagery playing a role in monitoring and verification, including by improving on-site visits and enabling monitoring by civil society groups. Innovations such as remote sensing, advanced imaging and data analytics could play crucial roles in enhancing transparency and confidence-building measures. In addition, Board members considered that the fears and game-changing nature of general AI could also present opportunities for States to collaborate strategically. By addressing shared concerns and vulnerabilities, fostering normative frameworks and engaging in diplomatic efforts, States could potentially enhance global security and stability, not least with the aim of preserving the nuclear taboo.

Initial analysis of associated risks and opportunities for the nexus between disarmament, development and human rights

37. Board members assessed the impact of advances in science and technology on development, including on the achievement of the 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals, the extent to which advances in science and technology lead to, affect or otherwise exacerbate trade-offs between development, prosperity and security, and what role the multi-stakeholder community could play in assessing their human rights impacts.

38. In that connection, the Board spent time discussing how social, economic, civil and political rights intersected with emerging technologies, posing complex challenges and opportunities for the respect and fulfilment of human rights globally, regionally and nationally. Members discussed how technologies that reduced human control could undermine civil and political rights, affecting individuals' safety and autonomy. They also discussed the need to ensure that technological advances, including military advances, did not infringe upon fundamental human rights, including the right to life, the right to dignity and other rights as provided for in the International Covenant on Civil and Political Rights and other international and regional human rights treaties. In addition, Board members briefly touched on collective or group rights, such as the rights of people with disabilities, women, children, refugees and indigenous groups, noting the importance of critically reflecting on how those groups – most of whom were more vulnerable to violence –

[10] A full summary of the presentations is included in annex I.

were affected by the development and use of emerging technologies in the military domain.

39. The Board noted that advances in technology could positively affect development agendas – such as poverty reduction through improved infrastructure, increased agricultural productivity, improved access to and delivery of health and education services, and support for humanitarian and disaster relief efforts. In that regard, technology might lead to the realization of human rights provided for in the International Covenant on Economic, Social and Cultural Rights and other regional human rights instruments.

40. Nevertheless, members expressed concern that a lack of access to or uneven distribution of certain technological or scientific advances would lead to growing inequalities between individuals and groups and among States, maintain or exacerbate exploitative structures and result in an increasingly uneven distribution of power and development at the global level. A scramble to extract the natural resources that were necessary to bolster technological advances could further fuel inequalities such as racial, ethnic, regional and gender inequalities, trigger possible resource collapse and even precipitate conflict and armed violence. In addition, Board members considered that the development of those technologies could also exacerbate global inequalities by diverting resources towards defence rather than addressing key socioeconomic issues such as education, poverty and health care. Moreover, concerns arose about data appropriation for military purposes, potentially at the expense of individual data privacy and societal development needs, as well as, for example, big data and AI systems stirring social unrest.

41. The Board also assessed how technological advances were fuelling the widespread availability of (illicit) small arms and light weapons, exacerbating human rights violations and stunting development across regions. In that connection, in a tailored presentation, Board member Carolina Ricardo discussed the rise of privately manufactured and non-industrial small arms, facilitated by advances such as three-dimensional printing and computer numerical control milling. Those weapons, often untraceable and highly lethal, exacerbated violence, in particular in regions plagued by organized crime and structural inequalities. A further concern was that, in addition to traditional smuggling routes, such weapons were increasingly circulated using online platforms such as social media and messaging apps, which were supported by online payment mechanisms, exposing significant regulatory gaps.

42. Board members discussed the need for a balanced approach to navigating the intersection of emerging technologies, including military technologies, human rights and sustainable development that promoted innovation while safeguarding individual and collective rights. Members advocated approaches that promoted sustainable practices, integrated environmental considerations into technological development, ensured equitable access to technology, fostered inclusive economic growth and strengthened regulatory frameworks to safeguard human rights and environmental sustainability. By reinforcing international norms, enhancing education and fostering transparent dialogue through a multilateral approach, stakeholders could mitigate risks and maximize the benefits of technological advances for global peace and development.

Potential future pathways

43. Although the Board is only at the midway point in its work, it has already begun considering potential pathways. In doing so, it has focused on proactive international cooperation and regulation to manage the profound impacts of new and emerging technologies on global security and disarmament efforts, recognizing the need to keep in mind that these should be applicable across a wide range of possible future

developments and scenarios and have the potential to gain the broadest possible international support.

44. Potential pathways that were discussed include standardized terms and criteria for assessing technologies on the basis of their potential risks to peace and security and categorizing technologies according to their complexity, such as through the use of a matrix, to determine issues pertaining to technical characteristics, risk and governance, in order to help determine whether they should be monitored, regulated or prohibited. Furthermore, reaffirming international law, including human rights law, and international humanitarian law and their applicability to emerging technologies, as well as exploring new concepts and frameworks with appropriate dialogue platforms for managing emerging technologies, similar to those used for climate change, for example, were also proposed.

45. The Board considered that navigating the impact of emerging technologies on international peace and security required proactive and coordinated efforts at the national, regional and international levels. The role of the United Nations emerged as pivotal in fostering international cooperation and setting norms and global standards in that evolving landscape while encouraging dialogue among Member States in other contexts. Members discussed the role of the United Nations disarmament machinery and how it could best be employed as a platform through which to discuss and regulate such technologies. The need for a revitalization of structures to enable better harmonization among Member States was noted, as was the need to include considerations of the impact on individuals, their rights and society at large to be able to holistically address the risks and threats of new technologies to international security. The Board highlighted that existing multilateral, regional and bilateral forums must adapt to address the impact of technological advances on existing weapon types, such as nuclear weapons and other weapons of mass destruction. That could include leveraging frameworks such as the Biological Weapons Convention and the Chemical Weapons Convention. Beyond the disarmament machinery, leveraging the United Nations as a dialogue platform with unique legitimacy given its universal membership was considered by the Board. It notably discussed, among other proposals, the possibility of the permanent five providing a statement on emerging technologies and their impact on international security, as well as the organization of a high-level gathering on the sidelines of the General Assembly to highlight the issue and build consensus towards a long-term global compact on emerging technologies and international security.

46. At the same time, given the critical role of the private sector in driving technological and scientific developments and that of civil society in ensuring that individuals' voices were heard and ensuring accountability, members underlined that any effort must be multi-stakeholder and inclusive in nature and aimed at the entire technological life cycle. The necessity of regulation at the international level was mentioned, as well as the importance of developing appropriate and relevant norms, ensuring due diligence, corporate responsibility and regulation of the private sector (for example, through codes of conduct) and reorienting the focus onto principles of common public good. Board members saw opportunities for capacity-building through increasing education on and awareness of the technologies, including dual-use technologies, conducting technology assessments, establishing new dialogue platforms, strengthening tailored and specific research, creating publicly funded computing capacities to generate greater public ownership, strengthening and reaffirming existing norms and developing new ones, and enhancing public awareness with a view to better managing the risks and opportunities presented by technological advances in the military sphere.

III. Board of Trustees of the United Nations Institute for Disarmament Research

47. The Advisory Board, acting in its capacity as the Board of Trustees of the United Nations Institute for Disarmament Research (UNIDIR), met twice in 2024 (on 30 January and 25 June) to review the operations, funding and programmes of UNIDIR.

Achievements in 2023/2024: results and impact

48. At the first meeting, in January 2024, the Director of UNIDIR provided an overview of the Institute's activities and impact in 2023, including notable growth in revenue and donor diversity, an ever more global and inclusive range of events on key issues, expert support for Member States and institutions at every level of governance, the launch of several new digital tools, a notable increase in key research outputs and the delivery of a more user-friendly, modern website. The Board was then briefed by UNIDIR heads of programmes on work relating to the growing use of craft-produced and improvised weapons, lessons learned and ways forward for gendered approaches to arms control and disarmament, research into the relationship between nuclear risks and converging technologies, and participatory research projects with conflict-affected young people. Trustees noted the timeliness, relevance and significant potential impact of those planned research activities, whose diversity reflected the broad spectrum of research that UNIDIR was currently undertaking.

49. Trustees noted with satisfaction a significant rise in the overall productivity of UNIDIR (with a 500 per cent increase in combined event and publication figures since 2018) and recognized the importance of the Institute's year-round support for several General Assembly-mandated groups of governmental experts and open-ended working groups, numerous review conferences and a wide range of other multilateral and regional processes. Trustees also acknowledged the role of UNIDIR in organizing critical events on topical issues, including a first-of-its-kind high-level retreat on revitalizing the Conference on Disarmament, the first global symposium on weapons and ammunition management, and a workshop on international law and the behaviour of States in the use of ICTs. They were briefed on the extension of the Middle East Weapons of Mass Destruction-Free Zone Project and the initiation of its second phase in the third quarter of 2023. Trustees welcomed the expansion of the Institute's range of digital platforms for supporting multilateral processes and dialogue, with the AI Policy Portal, the Biological Weapons Convention National Implementation Database, the Space Security Portal, the Lexicon for Outer Space Security and the Cyber Policy Portal Database all launched in 2023.

50. The outcomes of a two-day UNIDIR-Office for Disarmament Affairs strategic retreat in October 2023, which was aimed at ensuring regular cross-institutional coordination and information-sharing at all levels, were presented. Going forward, regular coordination meetings between UNIDIR and the Office will cover strategic priorities, workplans and events, providing a further boost to joint strategic initiatives and advancing the shared goal of strengthening multilateral disarmament and arms control. Noting increased demand for educational activities from the international community, the Director underlined the complementarity of the two entities: while the Office took the lead on the disarmament education aspect, UNIDIR focused on the substantive research aspect and offered research-based courses aimed at building capacity in specific areas. That work complemented existing educational tools, materials and formats used by both institutions.

51. During the second meeting, in June 2024, the Director provided details of priority areas for research in 2024 and of the activities of the Institute's Futures

Laboratory, including work on international security in 2045, the exploration of potential research angles in the field of maritime security, and analysis of the links between disarmament and development. Trustees were briefed on key recent activities, including Security Council briefings on cybersecurity and small arms and light weapons; the round table for AI, security and ethics; the innovative Women in AI fellowship building capacity among a group of 31 women diplomats from 31 countries around the world; and a novel capacity-building course on norms, international law and cyberspace. In showcasing impact monitoring by UNIDIR, the Director also highlighted one specific and recognized impact case study on the Institute's work towards the establishment of a comprehensive national weapons and ammunition management framework in Somalia.

52. Trustees noted with appreciation the focus of UNIDIR on diversity, which was reflected in its donor base, personnel and efforts to increase global reach through new partnerships and events in all regions. Similarly, trustees welcomed the Institute's global disarmament research network initiative and encouraged further streamlining of that networked approach to address the complexities of the twenty-first century security environment. Trustees were also briefed on the Institute's fellowship programme, which had recently been revamped following a period of reduced activity related to the coronavirus disease (COVID-19) pandemic. In 2024, UNIDIR started appointing a range of senior fellows whose globally diverse expertise offered the Institute valuable support and insight.

53. The Board was briefed on the increased efforts of UNIDIR to inform and engage its diverse stakeholders through improved strategic communication. Trustees noted the much-needed reinforcement of the Institute's communications team and expressed appreciation for the detailed presentation on activities in that area. In that connection, Trustees also noted that the Institute had the potential to reach an even wider audience, in particular among young people and in the global South, and it was agreed that efforts to do so would be discussed at future Board meetings. Finally, the Board received briefings from UNIDIR heads of programmes on the implications of artificial intelligence for international peace and security, on new developments in the domain of space security and on the objectives and planned activities for phase II of the Middle East Weapons of Mass Destruction-Free Zone Project.

Financial and human resources

54. With regard to UNIDIR finances, the Director noted that demand for the Institute's work continued on the steep growth trajectory of recent years. Donor revenue reached an all-time high of $12.6 million in 2023, up from $8 million in 2022. The Institute also had a record number of donors (37) in 2023, and – for the second year in a row – donors were drawn from all United Nations regional groups and included all five permanent members of the Security Council. That donor diversity was expected to continue in 2024.

55. Trustees were informed of the decision of the Organisation for Economic Co-operation and Development to grant the Institute an official development assistance co-efficient of 36 per cent from 2024 onward, up from 27 per cent in 2019. It represented a positive step for current or potential donors that had demonstrated a strong commitment to that criterion. The Board reiterated its appeal to all Member States to continue to make financial contributions that were multi-annual and unearmarked wherever possible to ensure the viability, independence, impartiality and research excellence of UNIDIR over the long term. The Director explained that even nominal unearmarked contributions were welcome as they helped to demonstrate the broad-based support that the Institute enjoyed.

56. In addition to those positive trends, the Board was also briefed on various risks that UNIDIR continued to face. First, in spite of growing donor diversity, the Institute remained significantly dependent on voluntary contributions, in particular from a limited number of large donors, and funding was made less flexible by the growing prevalence of earmarking. In 2023, 94 per cent of the Institute's revenue was earmarked, compared with 75 per cent in 2018. The increase in the development coefficient of UNIDIR was not expected to fully reverse the declining trend in unearmarked funds. The Director also conveyed that 2024 donor revenue was projected to be almost $2 million less than in 2023, demonstrating that UNIDIR was not immune to shifts in donor priorities resulting from geopolitical and economic uncertainties. Trustees were assured that the financial situation was being monitored closely and that there were enough funds carried forward from the previous year to allow implementation to continue on the intended growth trajectory for 2024 at least.

57. Against that backdrop, the Director presented a case for another increase in the subvention from the United Nations regular budget. He referred to the 2015 report of the Advisory Board on Disarmament Matters (A/70/186), in which the Board described the Institute's "irreducible core" of institutional leadership and research leadership as the driving force behind the Institute. The Director explained that an increase in regular budget funding would protect the autonomy and sustainability of the statutory research functions of UNIDIR, enable it to attract and retain world-class researchers to key positions and guarantee the Institute's ability to respond to growing demands for advisory support from the international community. Following the Board's endorsement of that proposal (in June 2023 and January 2024), the Director briefed trustees on the Group of Friends meetings hosted by France and Germany on 28 March and 21 June 2024, at both of which the widespread support of Member States for the Institute was confirmed. Noting the link between the volatile geopolitical situation, shifting donor priorities, budget constraints and imminent risks to UNIDIR in 2025, the Board underlined the timeliness and urgency of the request for an increase in the subvention, which would safeguard the stability and sustainability of the Institute's vital research functions. The Director also emphasized that a relatively moderate, timely investment at this point would have a significant lasting impact and avoid even higher costs at a later stage.

58. Updating the Board on human resources, the Director noted that currently only two of a total of 73 institutional positions (Director and Executive Officer) were covered by the regular budget. He elaborated on the Institute's cautious approach of deliberately delaying recruitment for certain posts, such as Deputy Director and New York Liaison Officer, in order to conserve cash. In the interim, related tasks had been subdelegated to heads of programmes and the Executive Officer. Considerable measures had nonetheless been taken to retain talent, not least through the provision of a medical insurance subsidy to staff on United Nations Office for Project Services contracts. Trustees were also informed of the outcome of a staffing review carried out by an external senior human resources specialist, as requested by the Advisory Committee on Administrative and Budgetary Questions. In the review, the specialist concluded that the growth in UNIDIR's staffing was justified, as it was due to significantly increased demand, and consequently a greater workload for the Institute, leading to an increase in its operational requirements. Having examined the funding structure of UNIDIR, the specialist also recommended an increase in the regular budget subvention as a means of improving the predictability and sustainability of the Institute's research in core areas.

2025 Programme of work and budget

59. In line with the Board's request of June 2023, UNIDIR presented a separate agenda item on the programme of work for 2025 and the proposed annual budget

estimates. The Director briefed trustees on the consolidation, expected growth and continuous development of its five core research programmes in 2025: security and technology, conventional arms and ammunition, space security, weapons of mass destruction, and gender and disarmament. The Institute's project on managing exits from armed conflicts and the second phase of the Middle East Weapons of Mass Destruction-Free Zone Project would also continue to be implemented in 2025. For the next research agenda, covering the period from 2025 to 2030, trustees proposed to discuss the updated strategic priorities and cross-programmatic initiatives of UNIDIR at the meeting in June 2025.

60. Trustees noted that UNIDIR had started its annual budgeting process for 2025, which would ultimately produce granular cost plans. The Institute would again work on the basis of two budgets: a conservative baseline budget and an optimal delivery budget. The budget figures would be presented at the Board meeting in January 2025. Based on current demand, historical trends and the strategic research agenda of UNIDIR for 2022 to 2025, the conservative projected expenditure indicated in the Director's report totals $12.3 million.

61. During the June 2024 session, the Board considered and adopted the Institute's 2025 annual programme of work for 2025 and the proposed annual budget estimates (A/79/146), taking into account the recommendations of the Advisory Committee on Administrative and Budgetary Questions on the draft report of the Director to the General Assembly.

IV. Future work and other matters

62. The Board will continue the programme of work in 2025 with a view to drawing up recommendations regarding the United Nations disarmament agenda and machinery in the light of the potential impact of science and technology trends. It will present its recommendations on the above in the 2025 report of the Secretary-General on the work of the Advisory Board of Disarmament Matters, to be presented to the General Assembly at its eightieth session.

Annex I

Summary of expert contributions at the eighty-first and eighty-second sessions of the Advisory Board on Disarmament Matters

At both sessions, the Board benefited from expert presentations and question-and-answer sessions with both external speakers and individual Board members, each tapping into their specific expertise, experience and areas of focus.

Elaborating on the issue of military applications of artificial intelligence (AI) was guest speaker Yi Zeng, a Professor and Director at the Brain-inspired Cognitive Intelligence Lab and the International Research Center for AI Ethics and Governance, both located at the Institute of Automation at the Chinese Academy of Sciences.

Focusing on challenges and opportunities for a framework for military AI, Mr. Zeng posited that more dialogue was needed – including on defining what constituted "human control" and on how to ensure that such control was both meaningful and sufficient. That was especially important given that relying on the mere existence of "human control" alone did not always lead to a desirable outcome, in particular in the case of cognitive overload in human-machine interactions. He gave particular attention to the risks of cognitive escalation emerging from intelligent behaviours that stemmed from large-scale language foundational models and the coordination of multiple agents that made it possible for AI to develop unpredictable capabilities. Such developments challenged traditional notions of hierarchical governance and control.

Board members organized several sets of expert presentations, focusing on the following sub-topics: new technologies, conflict and disarmament; new technologies and strategic stability; and new technologies and disarmament, development and human rights.

Speaking on the issue of new technologies, conflict and disarmament was Jina Kim, who provided a deep dive into, inter alia, developments related to military AI, the ways in which such new and emerging technologies (may) affect armed conflict, and what type of approaches would help to govern those technologies.

Ms. Kim examined the current landscape of the military AI market, which was projected to grow by 33.3 per cent between 2023 and 2028. Leading countries' armed forces were notably expanding spending in military AI, with that trend expected to continue owing to its potential benefits. AI advances promised enhanced intelligence, real-time target investigation, cyberattack neutralization, and reduced maintenance costs. It could also facilitate non-compliance recognition and reliable monitoring and mitigate vulnerabilities in arms export control.

At the same time, Ms. Kim noted that AI deployment in military contexts posed significant challenges. It might encourage riskier behaviour and alter the reasoning behind engaging in warfare as a result of automation bias and the emphasis of speed in decision-making, potentially exacerbating trust deficits and susceptibility to data poisoning attacks. States were generally resistant to arms control when weapons were widely deployed, strategically valuable or uniquely effective, thereby offering insights as to what timing would be most fruitful for pursuing disarmament and arms control measures.

AI arms control faced hurdles in both desirability (ensuring reciprocity and managing vulnerability) and feasibility (establishing clarity and capability). Regulatory efforts were complicated by the dual-use nature of AI and its widespread civilian applications, raising significant challenges in enforcement and compliance. Ms. Kim proposed potential successive steps that could be taken, including agreeing

to shared definitions, outlining principles of responsible behaviour, promoting transparency through unilateral declarations and pursuing non-legally binding commitments among like-minded nations.

Addressing the potential implications of new technologies on strategic stability were Board members Rose Gottemoeller and Anton Khlopkov, who examined a broad set of questions, including how advances in science and technology exacerbated existing strategic risks and created new ones, how rapid advances in science and technology contributed to the escalation of crises, and what the roles of the diplomatic community, policymakers and civil society were in understanding and acting on the impacts of emerging technology.

Ms. Gottemoeller explored the evolving concept of strategic stability in the current geopolitical landscape, beginning with its Cold War origins. Defined broadly, strategic stability now encompassed crisis management, arms race prevention and the broader goal of maintaining peaceful international relations among nuclear-armed States. That broader view was necessitated by contemporary conflicts, challenging traditional definitions and highlighting the importance of mutual predictability in international relations. Technological advances, such as additive manufacturing and advanced remote sensing, presented both opportunities and challenges for arms control and disarmament efforts. While technologies such as remote sensing enhanced verification capabilities, allowing for more transparent monitoring of nuclear activities, they also gave rise to concerns about the ease of missile production and potential destabilization.

Ms. Gottemoeller added that the introduction of artificial general intelligence was a pivotal concern, as it could introduce unpredictability into decision-making processes critical to nuclear deterrence. That unpredictability posed new risks of unintended escalation and undermined traditional deterrence strategies reliant on predictability. Disparities in technological access among States further complicated matters, potentially exacerbating distrust and fuelling arms races. Effective international frameworks and agreements were crucial for managing those risks, promoting transparency and preventing the misuse of emerging technologies. Diplomatic efforts and policy initiatives must prioritize understanding and regulating those technologies to ensure that they contributed positively to international peace and security, including through agreeing on norms and principles for safety and security, creating early warning systems to pre-empt escalatory situations and considering law enforcement measures to counter malfeasance.

In considering strategic stability in the context of modern technological advances and international frameworks, Mr. Khlopkov explored the definition and relevance of strategic stability, the role of emerging technologies, and pathways for enhancing existing instruments and forums.

The idea of strategic stability remained centred on preventing nuclear conflict by minimizing strategic risks. Currently, it encompassed broader dimensions including non-nuclear weapons with strategic effect, missile defence, space weapons and cyberspace. The expanded scope complicated consensus among nuclear-weapon States but was essential for global equilibrium and reducing the risk of catastrophic military clashes, as affirmed by the permanent five countries.

In this increasingly complicated landscape, emerging technologies such as AI, quantum technologies and hypersonic weapons presented dual-use capabilities that could either stabilize or destabilize international security. For instance, AI could optimize military operations and enhance early warning systems, yet its misuse could escalate conflicts or increase vulnerabilities in strategic systems. Effective application and regulation were crucial to harnessing those technologies for disarmament, non-proliferation and arms control efforts.

In that connection, Mr. Khlopkov examined ways in which existing multilateral, regional and bilateral forums must adapt to address the impact of technological advances on strategic stability. That could include leveraging frameworks such as the Biological Weapons Convention and the Chemical Weapons Convention and enhancing dialogue on cyberspace and outer space security. International cooperation, inclusivity in decision-making, and avoiding redundancy with existing regimes were paramount in managing the implications of new technologies effectively.

Finally, Jean-Marie Guéhenno and Carolina Ricardo explored the implications of science and technology for the nexus between disarmament, human rights and development by assessing their impact on the achievement of the Sustainable Development Goals and broader development goals, the extent to which advances in science and technology led to, affected or otherwise exacerbated trade-offs between development, prosperity and security, and what role the multi-stakeholder community could play in assessing the human rights impacts of weapons used in armed conflict.

Ms. Ricardo focused her presentation on the role of small arms and light weapons in cases of homicide, which, according to data provided in the Global Study on Homicide 2023 of the United Nations Office on Drugs and Crime, was the leading cause of violent death globally, surpassing conflict and terrorism combined. Emphasizing the disproportionate impact across regions, she explained that Africa and the Americas faced significantly higher homicide rates. Firearms played a central role, accounting for 40 per cent of global homicides, and up to 67 per cent in the Americas. Specifically in the Americas, the conflicts that caused the most deaths were those related to organized crime, gangs and violent crime. Those dynamics were strongly related to structural inequalities resulting not only from present local constraints but also from global illegal markets and structural violence.

Moving to technology and firearms, she discussed the rise of privately manufactured and non-industrial small arms, facilitated by advances such as three-dimensional printing and computer numerical control milling. Those weapons, often untraceable and highly lethal, exacerbated violence, in particular in regions plagued by organized crime and structural inequalities. In addition, she considered the diverse channels through which the weapons were circulated, including traditional smuggling routes and increasingly using online platforms such as social media and messaging apps. Those digital channels facilitated illicit arms transactions and revealed significant regulatory gaps.

Ms. Ricardo underscored the urgency of addressing the challenges collectively and comprehensively. Globalization and technological advances had democratized weapon production, necessitating coordinated responses to prevent those weapons from fuelling further violence and undermining human rights. Potential solutions could include prioritizing homicide prevention and reduction in global violence agendas and ensuring that arms control was central to that endeavour, developing comprehensive approaches to addressing privately manufactured and non-industrial small arms, advocating enhanced regulation of online platforms and digital payment services involved in arms trafficking, and encouraging the enhanced collection of data on the differential impacts of violence by demographics, in particular by race or ethnicity and gender, for targeted prevention efforts.

In his presentation, Mr. Guéhenno focused on the pivotal role of data in the digital technology revolution, emphasizing their profound influence in determining where knowledge and power were located, with a multiplicative effect. Drawing parallels with the invention of the steam engine, he highlighted how technological advances were reshaping power dynamics, driven largely by the private sector, outpacing regulatory frameworks. Moreover, the proverbial target for regulation kept shifting, as evidenced by the earlier hype around large language models that were

now generally understood to be merely a first step towards the full capabilities of AI. While artificial general intelligence was still a long way off, the concentration of technological power among States and huge corporations was a geopolitical concern, influencing dependencies and vulnerabilities, in particular in data management and encryption capabilities.

Mr. Guéhenno described how the proliferation of and reliance on data might transform conflict, noting that increasing data transparency had both positive (enhanced prevention capabilities) and negative (vulnerability to exploitation) implications. The blurring line between civilian and military targets further complicated warfare tactics and was exacerbated by the impact of misinformation and authoritarian measures. He was optimistic that there were opportunities for technology to fulfil a role as an enhancer of human capabilities, acknowledging that how that transpired would depend on the ethics of all actors involved.

Examining ideas for addressing geopolitical competition related to technologies, Mr. Guéhenno advocated ensuring open architectures to mitigate the concentration of technological power and enhancing research accessibility across institutions to safeguard human rights. In addition, he emphasized the need to ensure systemic accountability, protect critical infrastructures and leverage the data revolution to combat corruption.

Finally, D. B. Venkatesh Varma provided the Board with a working paper in which he outlined the factors that might be useful in assessing the impact of new and emerging technologies on arms control, non-proliferation and disarmament and suggested that the role of the United Nations centred on fostering dialogue, rule-making and rule harmonization to address the emerging governance deficit in that field.

Mr. Varma outlined a landscape in which rapid technological advances, spanning AI, quantum mechanics, biotechnology and more were increasingly integrated into military applications worldwide. Highlighting the role of the private sector in driving military innovation, he noted that technological advances increasingly originated in private companies rather than solely in State-driven initiatives. That shift challenged traditional notions of military oversight and regulation, as principles governing civilian applications might not seamlessly translate to the military domain.

Furthermore, the concentration of technological resources and capabilities among a few dominant countries and corporations complicated efforts at international regulation, with significant implications for global security and stability. Those dynamics contributed to an evolving arms race driven by the pursuit of technological superiority, further complicating efforts to maintain strategic stability and uphold international peace agreements.

Annex II

Members of the Advisory Board on Disarmament Matters, 2024

Nabeela Abdulla Al-Mulla
Distinguished lecturer at the American University of Kuwait and Chair of the Board of Trustees of the Kuwait College of Science and Technology
Kuwait City

Thompson Chengeta
Associate Professor of Law and Artificial Intelligence Technologies at the School of Law of Liverpool John Moores University
Liverpool

Rose Gottemoeller
Lecturer at the Freeman Spogli Institute of Stanford University
Stanford

Jean-Marie Guéhenno
Inaugural Kent visiting professor in conflict resolution at the School of International and Public Affairs at Columbia University
New York

Mary Kaldor
Professor Emeritus of Global Governance and Director of the Conflict Research Programme at the London School of Economics and Political Science
London

Anton Khlopkov
Director of the Center for Energy and Security Studies
Moscow

Jina Kim
Dean of the Division of Language and Diplomacy at Hankuk University of Foreign Studies
Seoul

Li Chijiang[1]
Vice-President and Secretary-General of the China Arms Control and Disarmament Association
Beijing

Federica Mogherini
Rector of the College of Europe and Director of the Pilot Programme of the European Diplomatic Academy
Brussels

Elina Noor
Senior Fellow in the Asia Program at the Carnegie Endowment for International Peace
Los Angeles

Eghosa Osaghae
Director-General of the Nigerian Institute of International Affairs
Lagos

[1] The President of the China Arms Control and Disarmament Association, Cheng Jingye, was appointed in May 2024 to replace Li Chijiang.

Patryk Pawlak
Visiting Fellow at the Robert Schuman Centre for Advanced Studies of the European University Institute
Brussels

Carolina Ricardo
Executive Director of the Sou da Paz Institute
São Paolo

Shorna-Kay Richards (Chair)
Ambassador of Jamaica to Japan
Tokyo

D. B. Venkatesh Varma
Ambassador (ret.) and former Permanent Representative of India to the Conference on Disarmament
Hyderabad

Robin Geiss (ex officio member)
Director of the United Nations Institute for Disarmament Research
Geneva