Youth 4 Disarmament Forum

United Nations Youth4Disarmament Forum Outcome Document

Addressing nuclear risks in the age of emerging technologies

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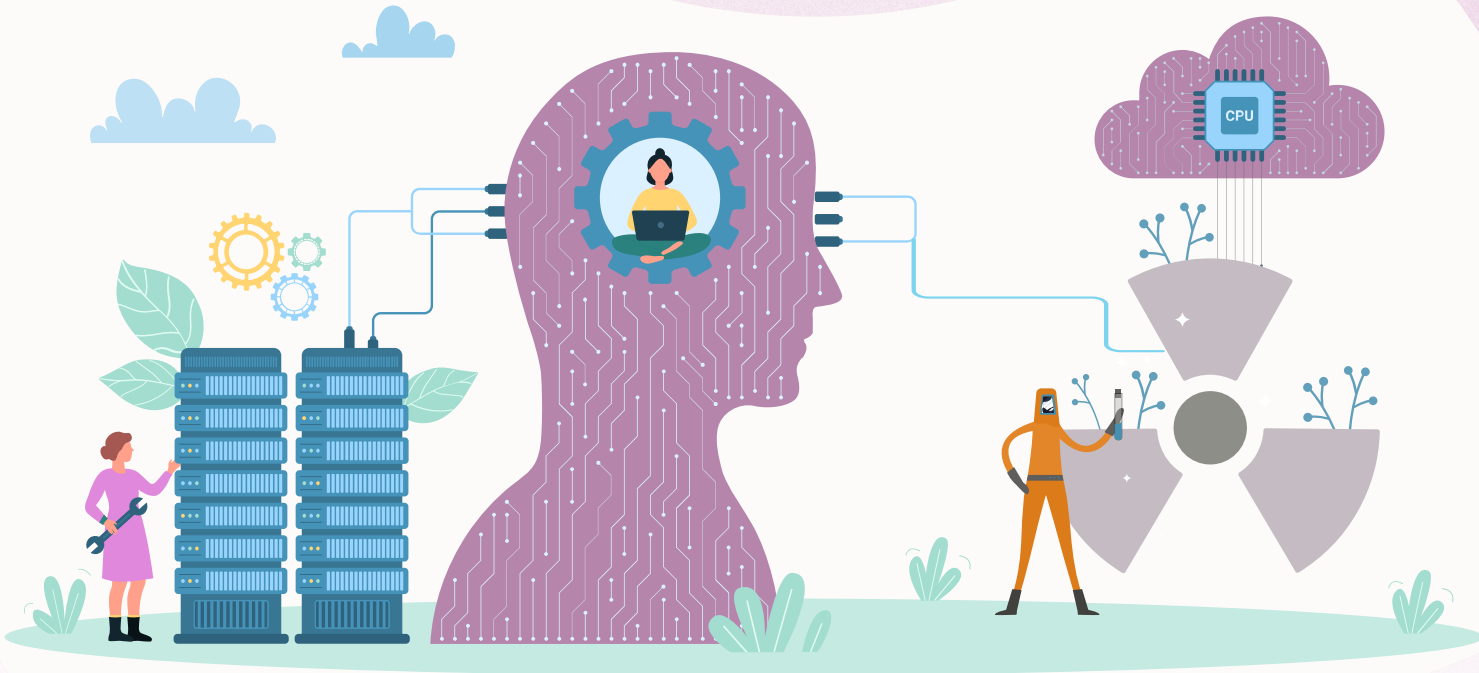
EXECUTIVE SUMMARY

The convergence of emerging technologies with nuclear weapons is reshaping global security. The first United Nations Youth4Disarmament Forum held from 16 to 17 October 2025 at the United Nations Headquarters in New York brought together a diverse group of early-career practitioners to translate this challenge into practical recommendations. We recommend that United Nations Member States and relevant entities establish a Working Group on Emerging Technologies and Nuclear Risk, establish red lines to restrict the use of artificial intelligence (AI) systems in critical nuclear functions, pledge not to conduct cyber activities on nuclear command, control, and communications, safeguard the space domain through sustained multilateral dialogue, and pilot AI- and quantum-enabled verification tools. To overcome fragmented deliberations and persistent underrepresentation of youth, Global Majority stakeholders, and technical experts, we call for institutionalized youth participation, capacity-building on responsible innovation, and structured channels that bridge policy and technical communities. Acting on these measures now will reduce nuclear risk, enhance confidence, and lay the groundwork for future disarmament.



I. Preamble

On 16 and 17 October 2025, the first United Nations Youth4Disarmament Forum, convened by the United Nations Office for Disarmament Affairs, gathered a diverse group of early-career professionals and advocates to address the evolving interplay between nuclear risks and emerging technologies.

Accelerating technological innovation is transforming the nuclear weapons landscape by entwining nuclear command, control, and communications (NC3) functions with cyber and space-based dependencies, compressing decision-making time, and diffusing dual-use capabilities to a broader set of actors.

These developments risk heightening misperceptions, lowering the thresholds for the use of force, and undermining existing legal and politically binding frameworks. The same technologies can help reduce nuclear risks by strengthening verification and monitoring, increasing transparency, facilitating, and improving the safety, security, and resilience of nuclear weapons stockpiles.

As they pursue progressive efforts to reduce and eliminate nuclear weapons, States need to address strategic risks and ensure the protection of civilians, in full compliance with international law. Addressing these challenges requires a holistic approach that encompasses setting common technical standards, reducing cross-domain risks, and implementing credible transparency and confidence-building measures.

Nevertheless, persistent gaps hinder progress. Multilateral discussions on emerging technologies in the context of international security remain fragmented across various forums, leading to blind spots on risks arising from their convergence. Additionally, youth, Global Majority stakeholders, and front-line communities affected by these issues are underrepresented in agenda-setting and norm development, often lacking sustained access to the resources needed to participate in intergovernmental discussions. This limits the diversity of proposed solutions and their effective adoption and implementation.

Given the inherent dual-use nature of several cutting-edge technologies, both developers and end users carry responsibility for ensuring compliance with legal obligations and ethical standards throughout system design, development and employment. Yet many of these scientists and engineers, particularly younger ones entering the field, lack structured training on the security implications of their work. Sustained skills development and awareness among young developers and researchers are therefore essential for safeguarding peace and security in a field evolving faster than policy can keep pace.

In this context, this document proposes specific measures to strengthen the normative foundations of international peace and security with a view to creating an environment conducive to global nuclear disarmament, while also creating sustainable pathways for youth and diverse expertise to contribute to the development of effective solutions.

II. Redefining participation and bridging communities

01

Institutionalize meaningful youth participation. We urge Member States to formalize and resource meaningful youth participation in intergovernmental processes at the national level and within the United Nations system through dedicated channels such as funded delegate slots, youth advisory boards, travel/visa facilitation, or speaking opportunities, and to provide consistent, multi-year funding to United Nations entities and relevant youth-focused organizations to ensure planning certainty and participation of youth from countries unable to self-fund.

02

Invest in youth capacity-building and education. We urge Member States, the United Nations system, and relevant international organizations to establish sustained, adequately resourced pipelines for youth skills development (e.g., training and mentorship programmes), embed responsible innovation and governance across higher education and vocational curricula, and develop and disseminate open educational resources to close gaps between young people and international institutions, prioritizing the Global Majority and underrepresented groups.

03

Structure multi-stakeholder engagement to bridge policy and technical communities. We call upon Member States to create structured channels for input from and communication with the private sector, academia, and civil society to inform deliberations, and to take meaningful steps to bridge the technical and policy communities through public-private partnerships, advisory councils, secondments, expert rosters, and structured liaison points, as well as exchange best practices through voluntary national reporting mechanisms that enable regular and transparent communication.

III. Governing emerging technologies for nuclear risk reduction

04

Elevate emerging technologies on the multilateral nuclear agenda, with an explicit focus on nuclear risk reduction. We call upon Member States to establish a Working Group on Emerging Technologies and Nuclear Risk, housed within existing multilateral mechanisms such as First Committee deliberations, the Treaty on the Non-Proliferation of Nuclear Weapons and the Treaty on the Prohibition of Nuclear Weapons review cycles, and the P5 group on risk reduction, to (a) deepen common understanding around how emerging technologies affect nuclear risk, (b) develop common terminology, analytical frameworks, and risk taxonomies, as well as (c) propose model national reporting templates and practical standards for transparency and confidence-building.

05

Restrict the use of AI systems in critical nuclear functions.

(a) Pledge not to integrate AI into launch authorization and autonomy in nuclear delivery platforms. In line with the Global Call for AI Red Lines, we urge nuclear-armed States to adopt a multilateral pledge not to integrate AI into launch authorization and autonomy in nuclear delivery platforms, as a first step towards further regulations. We further urge these States to provide meaningful assurance that technical failures in AI systems cannot trigger an inadvertent nuclear launch, including by isolating early warning systems from launch systems. We recommend that AI-enabled uncrewed vehicles, such as drones, be neither equipped with nuclear weapons nor employed as nuclear delivery platforms;

(b) Develop confidence-building measures to foster transparency about the potential use of AI in nuclear weapons-related functions. We encourage Member States to develop transparency, communication, and verification mechanisms to enhance predictability, build confidence, and enable future cooperation. We call upon nuclear-armed States to include in their national reports where AI is being explored or used within nuclear weapons-related functions and describe the governance arrangements, including technical and institutional measures that enable assurance, meaningful human oversight, judgment, control, and accountability, as well as mechanisms for de-escalation.



Protect nuclear command, control, and communications from cyber risks.

(a) Strengthen critical infrastructure protections by disaggregating conventional and nuclear command, control and communication (NC3) systems and pledging not to target NC3 systems. Under the new Global Mechanism, we urge Member States to adopt a multilateral, binding pledge not to conduct or support cyber operations that degrade, disrupt, or manipulate NC3 systems;

(b) Implement secure communications to mitigate cyber risks. We encourage Member States to assess options for strengthening the security of nuclear weapons-related, diplomatic, and government communications, including the potential future deployment of post-quantum encryption and other emerging technologies to secure communication. States should promote structured dialogue, pilot initiatives, and capacity-building efforts to ensure that any transition to more secure communication methods is practical and inclusive.



Preserve space security for strategic stability.*

(a) Raise awareness of the implications of the development, testing, and proliferation of counterspace capabilities for international peace and security. We call for the United Nations Member States to request the Secretary-General to establish a multistakeholder International Scientific and Policy Panel on the Implications of Counterspace Capabilities Development, Testing, and Proliferation for Strategic Stability. We urge the Panel to explicitly address a wide range of counterspace means, including both kinetic and non-kinetic and both Earth-based and space-based capabilities. The Panel should include experts from government, academia, and civil society, including youth representatives, to ensure diverse perspectives. The Panel should submit its findings to the United Nations General Assembly First Committee to inform discussions on preventing an arms race in outer space;

(b) Promote the exchange of information and views on space military doctrines and counterspace capabilities. We call for the United Nations General Assembly Member States to request that the Secretary-General convene, with the support of relevant United Nations bodies, a Global Space Military Doctrine Seminar. The seminar should provide an inclusive, multilateral forum for the exchange of information and views on space military doctrines, space-related military expenditures, counterspace capabilities, and risk reduction measures. A summary report should capture key themes, good practices, and options for future confidence-building measures;

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* We understand strategic stability as "a regional or global security environment in which states enjoy peaceful and harmonious relations". See Acton, James M. "Reclaiming Strategic Stability". In Strategic Stability: Contending Interpretations, edited by Elbridge A. Colby, Michael S. Gerson, and Strategic Studies Institute. U.S. Army War College Press, 2013.

(c) Foster dialogue on threat perceptions concerning missile technology and missile defence. We call for an international conference on ballistic missile defence to be convened, including participation from government officials from both nuclear and non-nuclear-armed States, academics, civil society, and youth groups, to address threat perceptions and assess implications for nuclear stability. The outcomes of the conference should be communicated to relevant international initiatives and forums, such as the Hague Code of Conduct against Ballistic Missile Proliferation and the Missile Technology Control Regime, to promote complementarity, avoid duplication of efforts, and strengthen the overall global framework for transparency and non-proliferation.



Strengthen international monitoring and verification capacity.

(a) Evaluate and pilot AI- and quantum-enabled tools for monitoring and verification. We invite Member States to provide technical and financial support to relevant international organizations with arms control, disarmament, and non-proliferation mandates to assess, pilot, and, where appropriate, adopt advanced technologies that improve the timeliness, accuracy, and transparency of nuclear disarmament verification. This includes time-bound pilot projects that responsibly test AI-enabled analysis, quantum-enhanced sensing and quantum key distribution, and secure data relay, with independent evaluation and public reporting of results to inform future standards, safeguards, and scalable deployment;

(b) Promote international cooperation in additive manufacturing and improve the detection and traceability of illicit activities. We encourage all Member States to request that the Secretary-General solicit and summarize the views of States on the risks and opportunities of additive manufacturing for international peace and security, as well as on best practices, standards, and safeguards for safe, secure, and reliable applications. We also call on the IAEA to convene Technical and Consultancy Meetings to address proliferation risks and to develop monitoring technologies and regulatory frameworks to identify suspicious patterns in additive manufacturing materials, equipment, digital design files, and supply chains that may indicate undeclared nuclear activities. We recommend that outcomes be published as a Technical Document to inform Member State reporting and compliance mechanisms.

IV. Conclusion

The intersection between nuclear weapons and emerging technologies requires immediate, coordinated, and inclusive action. We urge Member States, United Nations bodies, and international organizations to act decisively on this set of eight recommendations by resourcing youth pipelines, supporting fellowships and capacity-building programmes to enable participation in high-level decision-making, formalizing public-private cooperation, and adopting confidence-building measures that reduce misperceptions and foster mutual understanding. The commitments outlined here are necessary steps to safeguard humanity against escalating risks while leveraging technology for peace and security. We urge all stakeholders to translate these recommendations into concrete, time-bound actions that uphold strategic stability, protect civilians, and embed youth voices as co-architects of a safer, more resilient international order.

Annex

Risks and opportunities of emerging technologies for nuclear risk

Opportunities

For nuclear stability: monitoring, tracking, and verification

- **AI-enabled detection and fusion**: Automated anomaly detection in satellite imagery and telemetry, multi-sensor data fusion, and pattern recognition can elevate the timeliness and accuracy of monitoring nuclear weapons development, proliferation, and testing.
- **Space technologies**: Commercial and governmental satellite imagery, complemented by enhanced nuclear weapons-detonation and missile-tracking sensors, can improve situational awareness and reduce latency in detecting tests and related activities.
- **IAEA/CTBTO monitoring**: Machine learning over seismic, infrasound, and hydroacoustic streams can improve event discrimination and localization, while quantum-enhanced sensing enhances non-cooperative detection.
- **Traceable supply chains**: Additive manufacturing features (design signatures, embedded identifiers) enable authenticity checks and part provenance, useful for inspection regimes and safeguarding critical components.

For nuclear security: digital resilience, protected data flows, and attribution

- **Threat detection and forensics**: AI-enabled intrusion detection, behavioral analytics, and malware clustering enhance cyber defence for facilities and nuclear-relevant networks, while improving the technical attribution of hostile activity.
- **Resilient communications**: Post-quantum cryptography deployed on existing systems hardens command-adjacent, diplomatic, and verification channels. QKD adds tamper-evident key exchange without introducing new critical dependencies. Redundant communications pathways (terrestrial and space-based links, fail-safe routing) maintain continuity of critical exchanges under stress or disruption.
- **Protected monitoring data**: Secure data pipelines and integrity checks (e.g., cryptographic signing, authenticated logging) reduce risks of manipulation or exfiltration of sensitive inspection and monitoring datasets.

Risks

- **NC3 complexity and fragility**. Emerging technologies introduce complex failure modes and shorten warning windows in nuclear command, control, and communications systems. Brittle or opaque AI systems in warning and assessment, cyber spoofing/jamming and data-integrity attacks, counterspace threats to satellites alongside faster missiles, and premature insertion of quantum tools all contribute to making hurried, error-prone decisions more likely.
- **Misperception and escalation pathways**. Without clear policies, ambiguous activities, such as AI-related exercises, unclear cyber "red lines," and data manipulation, along with counterspace signaling and missile operations, can be misinterpreted in a crisis, thereby lowering thresholds for force and accelerating escalation.
- **Communications confidentiality and authenticity risk:** Nuclear-relevant communications and verification data become increasingly vulnerable as quantum computing's "harvest-now, decrypt-later" threat compromises encryption, cyber operations compromise integrity and availability, space disruptions degrade assured links, and AI systems generate disinformation.
- **Proliferation and supply-chain diffusion**. Additive manufacturing enables discreet, local production of sensitive components, while cyber theft or manipulation of design data further lowers barriers, complicating export controls, safeguards, and detection of illicit activity.
- **Assurance and accountability gaps**. Weak testing, evaluation, validation, and verification, along with blurred lines of human control, persist as AI remains brittle, opaque, and vulnerable to adversarial manipulation, cyber dependencies create new vulnerabilities, immature quantum tools are integrated into warning systems, and additive manufacturing lacks robust provenance and traceability standards.
- **Arms race accelerants and stability erosion**. Offense-defense dynamics intensify as faster, more precise missiles and expanding missile defense spur reciprocal build-ups. Rapid AI deployments lower thresholds for force and compress decision time; quantum sensing erodes stealth; additive manufacturing speeds force adjustments – shortening decision cycles and undermining stability.