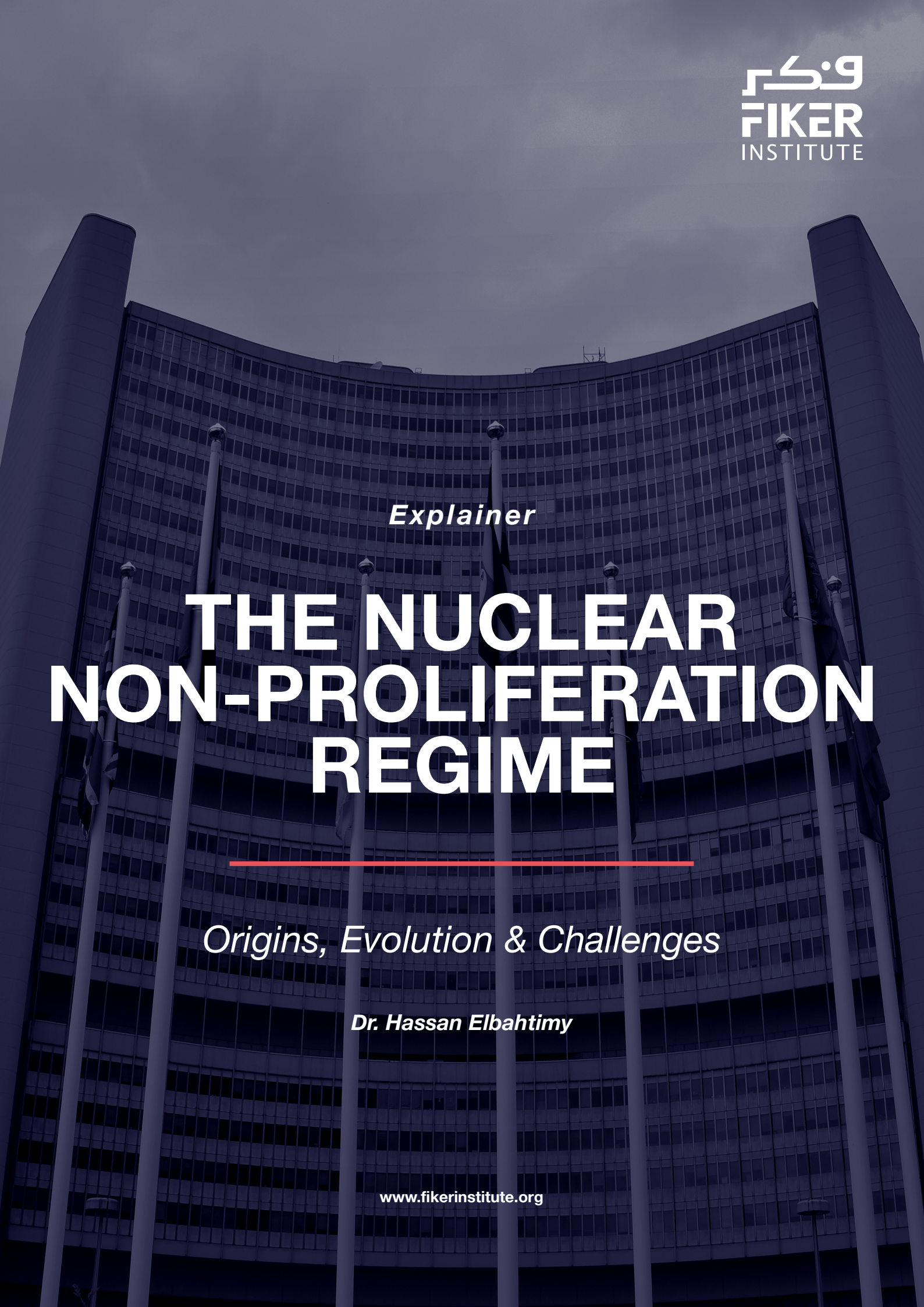

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Explainer

THE NUCLEAR NON-PROLIFERATION REGIME

Origins, Evolution & Challenges

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WHAT IS THE NUCLEAR NON-PROLIFERATION REGIME?

The nuclear non-proliferation regime is the international system of treaties, instruments, institutions, and norms that is primarily aimed at preventing the emergence of new nuclear weapon possessors. While this has focused for a long time on possible state possessors as the main threat, it has evolved to also include non-state actors and groups. It is called a 'regime' because it encompasses multiple interconnected tools including treaties, institutions, and norms. Importantly, international regimes, as scholars of international relations define them, establish shared expectations and standards of behavior among states in specific issue areas.[1] They provide a framework for cooperation within an international system otherwise characterized by competition. The nuclear non-proliferation regime is an important example of such a regime in practice, representing a collective effort to manage the specific challenge of nuclear proliferation internationally.

The non-proliferation regime's primary focus is on 'horizontal proliferation'—preventing more states from acquiring weapons—as distinct from 'vertical proliferation,' which involves existing nuclear-armed states increasing their arsenals. The regime's core objectives were formed from multiple and sometimes convergent interests. For the great powers, the core objective was preventing strategic instability. Nuclear weapons in more hands would mean more risks, as more nuclear actors would increase risks of regional escalation that could entangle them and challenge their global influence. For the many non-nuclear-weapon states (NNWS), the objective was also to gain mutual reassurance that their neighbors would not acquire these weapons, thus preventing costly and dangerous regional arms races. It is the combination of these perspectives that made the regime possible in its current form.

While the non-proliferation regime is important, it is but one major part of a broader 'nuclear architecture.' This includes arms control instruments, such as, for example, the New Strategic Arms Reduction Treaty (New START) treaty between Russia and the US, which is aimed at the reduction of nuclear arsenals. It also includes anti-nuclear testing instruments, such as the Comprehensive Test Ban Treaty, among many treaties and instruments addressing various aspects of nuclear policy. This wider nuclear architecture is generally geared towards restraint. It is built on the realization that nuclear weapons collectively present a unique danger. The architecture also aspires ultimately towards nuclear disarmament, a political linkage that remains a central and contentious feature of the regime.

WHAT ARE ITS KEY COMPONENTS?

The non-proliferation regime is not a single entity, but a multi-layered system composed of several key components, evolving over an extended period of time. Some of the regime's most important components include:

Treaty on the Non-Proliferation of Nuclear Weapons (NPT)

The NPT is widely considered as the foundational instrument of the regime, setting its fundamental rules and principles, as well as its tone. It has 191 state parties and it entered into force in 1970. It is widely perceived as a 'grand bargain' between the states party to it, and it is built around three pillars: achieving non-proliferation, moving towards nuclear disarmament, and allowing for the peaceful uses of nuclear energy. The non-proliferation pillar is the most detailed, and it is addressed in three core articles. Article I commits the five recognized Nuclear Weapon States (NWS) not to transfer nuclear weapons or assist any non-nuclear state in acquiring them. Article II commits Non-Nuclear Weapon States (NNWS) not to receive, manufacture, or otherwise acquire nuclear weapons. Article III requires all NNWS to accept verification (safeguards) from the International Atomic Energy Agency (IAEA) on all peaceful nuclear materials to ensure they are not diverted to weapons.

The IAEA & Safeguards

The IAEA is the key international organization conducting inspections and verification work in the nuclear field. It was established in 1957 as a direct response to the desire to enable the promised benefits of peaceful nuclear energy, while controlling the inherent risks of proliferation. Its key function within the regime is the application of nuclear safeguards. These are technical measures that allow the IAEA to monitor nuclear material and facilities, ensuring they are used exclusively for peaceful purposes. Despite the critical nature of its work, the IAEA is widely considered to be significantly underfunded. For instance, the organization's regular budget for 2024 was approximately €430 million—creating a persistent gap between its critical global mission and the limited resources at its disposal.

There are three relevant forms of safeguards. First, Item-Specific Safeguards which is an older system that only applies to specific facilities or materials agreed between the state and the agency. It is currently applied in states that are not part of the NPT, such as Israel, India, and Pakistan. Second, Comprehensive Safeguards Agreements which have become the standard NPT-mandated agreement for NNWS since the 1970s. It allows the IAEA to verify that all declared nuclear material in a state is used for peaceful purposes. Third, the Additional Protocol, is a more recent tool that gives the IAEA expanded rights of access and information, allowing it to provide assurances

not only about declared materials but also about the absence of undeclared nuclear activities.

Export Control Regimes

Export control regimes are not formal treaties but rather informal coordination mechanisms for states engaged in nuclear trading to harmonize their national export control policies. They aim to prevent the transfer of sensitive dual-use items that could aid a clandestine weapons program. For example, the Zangger Committee was formed in the early 1970s to coordinate and interpret the export control obligations outlined in NPT Article III.2. Importantly, the Nuclear Suppliers Group (NSG) serves as a coordination mechanism for nuclear exporters to ensure that controls are in place for dual-use items that can be used to produce nuclear weapons. Notably, the NSG requires comprehensive full-scope safeguards as a condition of nuclear supply.

Nuclear-Weapon-Free Zones (NWFZs)

These are regional treaties, currently available in Latin America, the Pacific, Africa, Southeast Asia and Central Asia, that reinforce the global non-proliferation norm. They legally prohibit the possession, development, or stationing of nuclear weapons within a specific geographic zone and often include enhanced verification measures and special security assurances from the NWS.

UN Security Council Resolution 1540

Adopted in 2004, UNSC Resolution 1540 is a unique and binding resolution that specifically targets the threat of proliferation to non-state actors. It mandates that all states must adopt and enforce domestic laws to secure sensitive materials, control borders, and prevent illicit trafficking and proliferation financing.

HOW DID IT EVOLVE?

The evolution of the nuclear non-proliferation regime is mostly a story of reactive, organic adaptation rather than the execution of a pre-planned grand design. Its components were developed over decades, responding to specific needs and sometimes crises. This evolutionary path was deeply shaped by the post-World War II international order, which was founded on the dual principles of state sovereignty and the necessity of collective action, as enshrined in the UN Charter, to prevent war and advance disarmament.

The atomic age began with a stark duality: the horrifying destruction of Hiroshima and Nagasaki in 1945, followed by the promise of abundant transformative peaceful energy. The impetus for a non-proliferation regime was born from the tension between

these two factors. The first driver was the fear of successive proliferation. The initial US monopoly on the bomb was short-lived, as the Soviet Union (1949), the United Kingdom (1952), France (1960), and China (1964) developed and tested their own nuclear arsenals. This steady 'horizontal proliferation' fueled fears of an uncontrolled cascade, leading to a world with dozens of nuclear-armed states.

The second simultaneous driver was the promise of peaceful uses of nuclear science. Initiatives like President Eisenhower's "Atoms for Peace" promoted the global sharing of nuclear technology for energy and medicine. This created the regime's central paradox: the very technologies being shared, such as uranium enrichment and plutonium reprocessing, provided the technical pathway to fissile material for a bomb. The world was therefore encouraging the spread of a dual-use technology while simultaneously fearing its consequences.

This tension reached a peak in October 1962 during the Cuban Missile Crisis when the world came to the precipice of nuclear annihilation. The crisis provided the impetus for the international community to start thinking about reducing nuclear risks. An early result was the Partial Test Ban Treaty (PTBT) in 1963, a US-Soviet-UK agreement that prohibited atmospheric testing of nuclear weapons in response to global pressure over the impact of radioactive fallout. In the mid-1960s, NPT negotiations also started to take a serious turn. On the one hand, the US and USSR sought to stabilize their strategic rivalry and prevent allies (like West Germany or Japan) from complicating the bipolar Cold War by acquiring their own weapons. On the other hand, in the era of decolonization, many newly independent states wanted to prevent regional arms races, while simultaneously demanding that any non-proliferation bargain not infringe on their sovereignty. They successfully lobbied for the inclusion of nuclear disarmament provisions and the right for peaceful nuclear uses. The resulting NPT (opened for signature in 1968) was a negotiated compromise born directly from the dual pressures of proliferation fears and peaceful use promises.

Four key events challenged ideas about effective regime building and provided impetus for the non-proliferation regime to evolve. Apart from driving more serious NPT negotiations, the Cuban Missile Crisis ignited a powerful regional movement in Latin America to shield itself from the nuclear competition between superpowers in their backyard. The Treaty of Tlatelolco (1967) established the first Nuclear-Weapon-Free Zone (NWFZ).[2] This regional model, driven by non-nuclear states, proved highly successful and was later replicated in the South Pacific, Southeast Asia, Africa, and Central Asia.

Another landmark event was the Indian nuclear test in 1974. The test raised concerns about further proliferation particularly given that India used imported civilian technology to conduct its nuclear explosion. This led to the creation of the NSG export regime in

1975.[3] This supplier-led coordination mechanism imposed stricter export controls on nuclear and dual-use technology than the NPT required, notably requiring full-scope safeguards as a condition of supply.

The discovery of Iraq's advanced, undeclared nuclear weapons program following the First Gulf War in the 1990s–despite it being an NPT member with safeguards—was another profound challenge for the non-proliferation regime. It proved that the IAEA's system, which focused only on declared materials, was insufficient. This led to the development of the Additional Protocol in 1997.[4] This new instrument provided the IAEA with enhanced authority and access to search for undeclared nuclear materials and activities, thus strengthening its verification capacities.

Finally, the exposure of a sophisticated black market network run by Pakistani scientist A.Q. Khan, supplying nuclear technology to Iran, Libya, and North Korea, combined with the 9/11 attacks, created fear that the regime might be undermined. This spurred the adoption of UN Security Council Resolution 1540 in 2004.[5] This top-down, legally binding resolution compels all states to enact domestic laws to prevent non-state actors from acquiring weapons of mass destruction, addressing the illicit trafficking and financing gaps the Khan network had exploited.

WHAT ARE TENSIONS WITHIN THE REGIME?

The nuclear non-proliferation regime is not a harmoniously functioning system all the time. It contains many tensions, some of which are built into its very structure. These tensions are often exacerbated by contemporary political and technological shifts, placing the regime under significant stress. These challenges can be grouped into three categories: inherent structural tensions, problems of non-universality and non-compliance, and modern political stressors.

Inherent Structural Tensions

These are the fundamental tensions embedded within the regime's foundational grand bargain and are a result of the compromises required to create it.

Discrimination vs. Equality

The NPT's 'original sin' is its two-tiered structure, which codifies a world of 'haves' (the five NWS) and 'have-nots' (all other NNWS). This institutionalized discrimination is an important source of political friction within the regime.[6] While NNWS agreed to this temporary bargain, it was on the condition that the NWS would actively pursue disarmament under Article VI. The NWS's continued reliance on, and modernization of, their nuclear arsenals fuels deep resentment and accusations of hypocrisy, undermining the regime's overall legitimacy.

Disarmament Pledge vs. Deterrence Practice

The tension between discrimination and equality practically manifests in the tension between disarmament and deterrence. Article VI of the NPT legally obligates the NWS to "pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament." However, the security policies of the NWS and their allies are based on the indefinite retention of nuclear weapons for deterrence. This fundamental contradiction—a legal pledge to pursue disarmament versus a strategic doctrine of permanent deterrence—has created a credibility crisis.[7,8] It has led many non-nuclear states to conclude that the NWS are not fulfilling their end of the bargain, prompting efforts like the Treaty on the Prohibition of Nuclear Weapons, which entered into force in 2021.[9]

Peaceful Use Rights vs. Proliferation Risk

One of the regime's key challenges is the dual-use nature of nuclear technology.[10] Article IV of the NPT affirms the "inalienable right" of all states to research, develop, and use nuclear energy for peaceful purposes. However, some key technologies, such as uranium enrichment and plutonium reprocessing, can serve both civilian and military purposes. This creates intractable tension between supplier states (like the NSG members), who seek to restrict enrichment and reprocessing technologies to mitigate proliferation risk, and recipient states (often from the developing world), who view such restrictions as an infringement on their sovereign rights under Article IV.

Verification Intrusiveness vs. National Sovereignty

Effective non-proliferation requires intrusive verification, through inspections and auditing, to ensure compliance. The IAEA's Additional Protocol, for example, grants inspectors wide-ranging access to information and locations to look for undeclared nuclear activities. This inevitably clashes with the foundational UN principle of national sovereignty.[11] States, even those with no intention of proliferating, are often resistant to what they perceive as overly intrusive inspections, citing concerns over espionage and the protection of their industrial or military secrets. This tension manifests in political battles over IAEA access and the fact that the Additional Protocol is still not universally adopted.

Challenges of Non-Universality & Non-Compliance

This set of tensions stems from states that exist partially or entirely outside the regime's rules, as well as those who violate them from within.

The Outsiders

The regime's goal of universality is permanently undermined by three states that object

to joining the NPT. India and Pakistan both developed nuclear weapons outside the treaty, creating a persistent source of regional instability in South Asia. Israel maintains a policy of nuclear ambiguity, and its non-membership in the NPT is a central grievance for other regional states, creating a major roadblock to other security agreements in the Middle East. The existence of these states creates a de facto 'third category' of states that are neither NWS recognized by the NPT, nor NNWS, which the NPT was never designed to handle and which fuel arguments of double standards.

The Withdrawn State

North Korea (DPRK) represents a unique and direct challenge to the regime's integrity. It joined the NPT as a NNWS, secretly violated its obligations, and in 2003 announced its withdrawal—a move of disputed legality. By subsequently developing and testing nuclear weapons, the DPRK demonstrated that a determined state could use the NPT's peaceful-use provisions to acquire technology, only to later abandon the treaty, profoundly damaging its credibility.

Compliance Issues

Iran's nuclear program represents a chronic strain on the regime's verification system. Its history of clandestine nuclear activities, discovered in the early 2000s, constituted a breach of its safeguards obligations. While the 2015 Joint Comprehensive Plan of Action Accord provided temporary limits, the ensuing disputes over the scope of IAEA access, Iran's advancing enrichment levels, and the lack of a clear, unified enforcement mechanism from the UN Security Council highlight the regime's difficulty in managing a determined state that sits on the nuclear threshold.

Contemporary Political and Technological Stressors

These are more recent developments that place new strains on the regime's functioning and are a product of the changing state of current politics.

Erosion of Great Power Consensus

The non-proliferation regime was built on a baseline of US-Soviet (and later US-Russia) cooperation which is currently shaky. The collapse of the arms control framework (like the Intermediate-Range Nuclear Forces Treaty, which the US officially withdrew from in 2019, and the lack of prospects for a follow-on to the New START Treaty) as well as the rise of strategic competition between the US, Russia, and China have highlighted fissures among key international players that extend to the nuclear non-proliferation regime. This rivalry makes it increasingly difficult to find consensus on enforcement actions within the UN Security Council or to achieve substantive agreements at NPT Review Conferences and frequently contributes to diplomatic paralysis.

Weakening Normative Commitment

The renewed salience of nuclear weapons in the security doctrines of the NWS, including extensive modernization programs and heightened nuclear rhetoric, sends a powerful signal to the rest of the world: nuclear weapons are essential for security. This legitimization of nuclear weapons directly weakens the non-proliferation norm. It encourages allies living under a 'nuclear umbrella' (e.g., South Korea, Japan) to question the credibility of those guarantees and openly debate acquiring their own indigenous deterrents.

Emerging Technologies

New technologies threaten to create new, unmonitored pathways to proliferation or undermine existing verification methods.[12] Advancements in additive manufacturing (3D printing) could potentially allow for the illicit production of complex components like centrifuges. Malicious cyber operations could target nuclear facilities to cause sabotage or steal sensitive information. The regime, which was designed in the 20th century, now faces the challenge of how to adapt to these 21st-century threats.

CONCLUSION

The nuclear non-proliferation regime has evolved from a patchwork of agreements into an important architecture of nuclear restraint globally. By codifying the norm of non-possession of nuclear weapons and establishing important verification standards, it has significantly contributed to shaping nuclear and global politics. Yet, the regime now faces some formidable challenges. Deep structural fractures, including inequality, the disarmament deficit, and the tolerance of nuclear latency, are compounding threats of geopolitical rivalry, lack of universality, and the challenge of new disruptive technologies. While the regime has historically proven resilient and adaptive, its ability to survive those converging challenges without splintering will be a pivotal test for global security in the years ahead.

About the Author

Dr Hassan Elbahtimy is a Senior Lecturer in the Department of War Studies at King's College London and co-chair of the Beyond Nuclear Deterrence Working Group at Harvard University. He has written widely on the global politics of nuclear, chemical, and biological weapons, with his work appearing in Foreign Affairs, the Journal of Strategic Studies, Security Studies, the Nonproliferation Review, and the Journal of Peace and Nuclear Disarmament. His research was awarded the McElveny Grand Prize by the Nonproliferation Review. Dr. Elbahtimy previously served as Director of the Centre for Science and Security Studies. He is also a former trustee and executive committee member of the British International Studies Association (BISA), where he twice chaired the committee for the Ling Outstanding First Book Prize.

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December 2025

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