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Nuclear Security Dilemma, Combating WMD Proliferation Threats: A Policy-Level Comparative Study of the United States, Russia, and China (Case Study)

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ABSTRACT: Since its emergence, the proliferation of weapons of mass destruction, including nuclear, biological, and chemical weapons, has posed an existential threat to human civilization. This threat became particularly acute during the Cold War, which established a nuclear security dilemma between the world's major powers. Its aftermath further complicated the global landscape, with the rise of new nuclear states and rogue actors seeking access to such weapons.

Therefore, this study examines the roles and the policies of the United States, Russia, and China in combating the WMD proliferation through international treaties, bilateral agreements, and disarmament initiatives. This study also points out that the nuclear security dilemma still persists among these same powers, despite sustained and continuous efforts at disarmament.

KEYWORDS: Nuclear security dilemma, WMD proliferation, United States, Russia, China, disarmament policies

INTRODUCTION

The proliferation of weapons of mass destruction, including nuclear, biological, and chemical weapons, remains one of the most pressing global issue in contemporary times. Addressing this challenge requires major attention and significant engagement from key international political players. Among these nuclear powers, the United States, Russia, and China stand as the most crucial actors, as they possess the world's largest stockpile of nuclear arsenals. This nuclear capability not only defines their military strength but also shapes their political influence at the global level.

Since the invention of nuclear weapons, and over the years, these major powers have taken varied approaches in combating the threats associated with the proliferation of the WMD.

The threat of WMD proliferation escalated during the Cold War era (1947-1991), which was primarily shaped by the confrontation between the United States and the Soviet Union (of which Russia became the legal successor state of the defunct Soviet Union). This rivalry gave rise to the nuclear security dilemma, a condition in which the nuclear arms race of a single state ultimately leads to a similar race by counterpart states, thereby bringing global instability and mistrust between nations.

China also emerged as a nuclear power during this period, adding another dimension to the global nuclear balance.

Beyond the USA and the USSR rivalry, the India-Pakistan nuclear arms race, particularly since both countries conducted nuclear tests in 1998, also serves as a clear example of the nuclear security dilemma.

Nuclear Security Dilemma and Combating WMD Proliferation Threats: The Policy and Role of the United States Since the Cold War Era

Since the Cold War era, the United States has pursued policies aimed at curbing WMD proliferation through multilateral agreements and treaties, including the Non-Proliferation Treaty (NPT, 1968), the Chemical Weapons Convention (CWC, 1993), and the Biological Weapons Convention (BWC, 1972). While these efforts demonstrated America's commitment to non-proliferation, they also reflected the inherent tension of the nuclear security dilemma, in which the U.S. seeks to prevent proliferation while maintaining its own nuclear superiority.

The United States emerged from the Cold War as the world's leading economic power. This economic advancement enabled significant technological capabilities, including the development of a missile defense system based on a network of anti-ballistic missiles, which was believed to be the most effective form of protection against nuclear attack.[1]

The United States also actively imposed economic sanctions against rogue states seeking access to nuclear and missile technologies by using economic pressure as a tool to deter proliferation. This sanctions-based approach reflects another critical dimension of U.S. policy toward combating WMD proliferation.

[1] Rhodes, Richard. Arsenals of Folly: The Making of the Nuclear Arms Race. New York: Alfred A. Knopf, 2007. p. 179-180.

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In 1983, President Ronald Reagan proposed the Strategic Defense Initiative (SDI), popularly known as "Star Wars", which sought to develop a space-based missile defense system to protect the United States from nuclear attack. While Reagan envisioned SDI as a path toward eliminating the nuclear threat, critics argued that such a system would destabilize the existing balance of power and intensify the nuclear security dilemma. According to Heywood, although the proposed missile defense system was never fully developed or deployed, its announcement triggered a renewed phase of arms competition with the Soviet Union. This intensified rivalry placed significant economic pressure on the already strained Soviet economy and may have contributed to the eventual end of the Cold War.[2]

U.S nuclear policy has long been marked by a fundamental contradiction between its diplomatic and military dimensions. Diplomatically, the United States has committed to limiting nuclear arsenals and preventing WMD proliferation through international treaties and agreements. Militarily, however, strategic doctrine has demanded preparation for worst-case scenarios, necessitating continued investment in nuclear capabilities.[3] This inherent tension became more acute after the September 11, 2001 terrorist attacks, which led to stricter and more direct policies on armament, reinforcing the nuclear security dilemma.

Following the heightened security measures of the post-9/11 period, a notable shift in U.S. nuclear policy emerged with the Obama administration. On April 5th, 2009, President Barack Obama outlined a vision for "a world without nuclear weapons," while he also expressed hope that abolishing nuclear weapons would enhance global safety. This was not an entirely new idea, rather, it reflected a liberal approach to nuclear policy that had long been advocated within the Democratic Party. Obama pledged to work toward strengthening the Nuclear Non-Proliferation Treaty (NPT) as a foundation for international cooperation, stating: "Together, we will strengthen the Nuclear Non-Proliferation Treaty as a basis for cooperation". He also committed to pursuing ratification of the Comprehensive Test Ban Treaty (CTBT). However, Obama acknowledged the challenges inherent in this pursuit: "We go forward with no illusions. Some will break the rules, but that is why we need a structure in place that ensures that when any nation does, they will face consequences". He equally emphasized the need to strengthen international inspections to ensure compliance with non-proliferation commitments.[4]

The Obama administration's vision for nuclear disarmament faced new challenges as the geopolitical landscape shifted under President Donald Trump. In a dramatic departure from conventional diplomatic practice, Trump pursued direct engagement with North Korea over its nuclear program. On June 12th, 2018, Trump met with North Korean leader Kim Jong Un in Singapore. It was the first meeting between a sitting U.S. president and a North Korean leader since the Korean War (1950–1953). This historic encounter represented a significant political act, as it raised hopes for a breakthrough in the decades-long nuclear standoff on the Korean Peninsula.

The Singapore Summit concluded with both leaders agreeing to pursue the "complete denuclearization of the Korean Peninsula."[5] However, the agreement lacked specificity, as it failed to define what denuclearization meant or how it would be achieved, thus rendering it largely a symbolic political gesture rather than a substantive framework for action.

Trump and Kim Jong Un met for a second time in February 2019 in Hanoi, Vietnam. The meeting broke down after a rift emerged over the lifting of sanctions. Trump rejected Kim's call for major sanctions relief in exchange for dismantling North Korea's main nuclear complex.[6] Several months later, in June 2019, the two leaders met for a third time at the jointly controlled area inside the Demilitarized Zone (DMZ) between the two Koreas. During this encounter, Trump crossed into North Korean territory, thereby becoming the first sitting American president to do so.

Despite three summits, neither side had much to show for its efforts. North Korea continued to conduct short-range missile tests, while renewed tensions on the Korean Peninsula ultimately led to the collapse of the denuclearization negotiations. While the Trump administration's engagement with North Korea was historically unprecedented, failed to produce concrete progress toward reducing the nuclear threat.

While engaging with North Korea, the Trump administration simultaneously adopted a more confrontational stance toward Russia on nuclear arms control. In February 2019, the administration announced that the United States would begin withdrawing from the Intermediate-Range Nuclear Forces (INF) Treaty, a landmark 1987 nuclear arms pact with Russia. The administration justified this decision by asserting that the Kremlin had violated the treaty for years through the development and deployment of prohibited missile systems.[7] Russian President Vladimir Putin denied all allegations, while maintaining that Russia remained in full compliance with its treaty obligations. Moscow in turn accused the United States of seeking pretexts to abandon arms control commitments in pursuit of strategic advantage.

Therefore, the collapse of the INF Treaty marked a significant setback for the post-Cold War arms control framework and raised concerns about a renewed nuclear arms race between the world's two largest nuclear powers. This development underscores the persistence of the nuclear security dilemma in the U.S.-Russian relations. This dynamic will be examined in greater depth in the following chapter, by analyzing the policy and role of the Russian Federation in addressing WMD proliferation threats since the Cold War era.

[2] Heywood, Andrew. Global Politics. New York: Palgrave Macmillan, 2011. P. 276.
[3] Kristensen, Hans M. U.S. Strategic War Planning after 9/11. Nonproliferation Review, Vol. 14, No. 2, 2007, pp. 373–390.
[4] Obama, Barack. Remarks by President Barack Obama. Hradcany Square, Prague, Czech Republic, April 5, 2009. https://obamawhitehouse.archives.gov/the-press-office/remarks-president-barack-obama-prague-delivered
[5] Joint Statement of President Donald J. Trump of the United States of America and Chairman Kim Jong Un of the Democratic People's Republic of Korea at the Singapore Summit. The White House, June 12, 2018. https://trumpwhitehouse.archives.gov/briefings-statements/joint-statement-president-donald-j-trump-united-states-america-chairman-kim-jong-un-democratic-peoples-republic-korea-singapore-summit/
[6] Trump-Kim Summit Ends With No Deal. Arms Control Association, March 2019. https://www.armscontrol.org/act/2019-03/news/trump-kim-summit-ends-no-deal
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Nuclear Security Dilemma and Combating WMD Proliferation Threats: The Policy and Role of the Russian Federation Since the Cold War Era

The Russian Federation which became the legal successor state to the Soviet Union inherited the world's largest nuclear arsenal along with the complex responsibilities that accompanied it.

However, since the end of the Cold War, Russia has faced numerous challenges regarding safeguarding its own nuclear stockpile, while simultaneously engaging in negotiations on disarmament, arms reduction treaties, and agreements alongside other major powers. Balancing these obligations has placed Russia at the center of the nuclear security dilemma: the need to maintain a credible nuclear deterrent for national security, while also committing to international non-proliferation efforts. This chapter will analyze how Moscow has navigated the tension between its strategic interests and its commitments to global nuclear governance.

In the early years following the end of the Cold War, Russia demonstrated significant commitment to nuclear arms reduction and non-proliferation efforts. The Russian Federation worked closely with the United States to implement the Strategic Arms Reduction Treaty (START I, 1991), which mandated substantial cuts in strategic nuclear warheads and delivery systems.[8] This was followed by START II (1993), which sought to further reduce nuclear arsenals and eliminate multiple independently targetable reentry vehicles (MIRVs) on intercontinental ballistic missiles.[9]

Russia also signed the Comprehensive Nuclear-Test-Ban Treaty (CTBT) in 1996 and played a key role in the indefinite extension of the Nuclear Non-Proliferation Treaty (NPT) in 1995. Additionally, through the Cooperative Threat Reduction (CTR) Program, also known as the Nunn-Lugar Program, Russia collaborated with the United States to secure and dismantle nuclear, chemical, and biological weapons inherited from the Soviet era.

These early efforts reflected Moscow's willingness to engage constructively in the post-Cold War arms control framework, it also signaled a departure from the confrontational posture of the Soviet period. However, this cooperative phase was not to last. As NATO expanded eastward, this expansion became a perceived threat to its security interests. Therefore, this situation reignited the nuclear security dilemma which prompted Moscow to recalibrate its nuclear posture and adopt a more assertive stance on strategic matters.

The spirit of cooperation that characterized the 1990s did not endure into the following decade. As the United States pursued NATO enlargement and withdrew from the Anti-Ballistic Missile (ABM) Treaty in 2002, Russia increasingly viewed these actions as threats to its national security. Moscow feared that unconstrained U.S. missile defense development could undermine the strategic parity that had long underpinned nuclear deterrence between the two powers. This concern was articulated by Prime Minister Vladimir Putin on December 29th , 2009, when he declared on television: “The problem is that our American partners are developing missile defenses, and we are not.”[10] Putin's statement reflected a fundamental element of the nuclear security dilemma, in which one state's defensive measures may be perceived by another as an offensive threat, thereby prompting countermeasures and escalating mutual insecurity.

Despite these age-long tensions, there has been sustained diplomatic efforts towards a solution. On April 8th, 2010, Presidents Obama and Medvedev signed the New START treaty in Prague, which replaced the expired START I agreement. The treaty represented a significant step in bilateral arms control, by limiting each nation’s stockpile to 1,550 deployed strategic nuclear warheads and 800 deployed and non-deployed strategic delivery systems, including ICBMs, SLBMs, and heavy bombers. Most importantly, the agreement preserved flexibility by allowing each side to determine its own force structure within these limits. The verification regime included on-site inspections, data exchanges, notifications related to strategic offensive arms, and monitoring through national technical means, thereby enhancing transparency and mutual confidence.[11]

However, the ratification process revealed the domestic political complexities surrounding arms control. While the Russian Duma approved the treaty relatively smoothly, the U.S. Senate passed through a long period of debate. Republican Senators equally raised concerns regarding funding for the modernization of U.S. nuclear forces, by questioning whether the treaty would constrain America's ability to maintain a credible deterrent. Others criticized the agreement for failing to address Russia's significant advantage in tactical nuclear weapons, which remained outside the treaty's scope. Following an eight-month delay and extensive debate, the Senate voted 71-26 on December 22nd, 2010 which thereby ratified the New START. The treaty entered into force on February 5th, 2011, which marked a renewed commitment to strategic arms reduction, even as underlying tensions over missile defense and tactical weapons persisted.

The deterioration of the arms control framework have continuously accelerated in the following years. In August 2019, Russia formally withdrew from the Intermediate-Range Nuclear Forces (INF) Treaty, which was a landmark agreement signed between the United States and the Soviet Union in 1987, and which led to the elimination of an entire class of nuclear delivery systems. The collapse of this treaty removed a key constraint on both powers and raised concerns about a renewed arms race in Europe. The erosion of Cold War-era agreements continued in November 2020, when Russia announced its intention to withdraw from the Open Skies Treaty. This treaty was an accord that had permitted member states to conduct unarmed surveillance flights over each other's territories as a confidence-building measure. These withdrawals signaled a broader unraveling of the verification and transparency mechanisms that had underpinned strategic stability for decades.

[8] Arms Control Association. START I at a Glance. Arms Control Association Fact Sheets. https://www.armscontrol.org
[9] Arms Control Association. START II at a Glance. Arms Control Association Fact Sheets. https://www.armscontrol.org
[10] Al Jazeera. Putin Warns US over Missile Defence. Al Jazeera, December 30, 2009. https://www.aljazeera.com/news/2009/12/30/putin-warns-us-over-missile-defence
[11] Woolf, Amy F. "The New START Treaty: Central Limits and Key Provisions." Congressional Research Service, R41219. https://www.congress.gov/crs_external_products/R/PDF/R41219/R41219.61.pdf

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The future of strategic arms control now hangs in the balance. New START, the last remaining treaty limiting the deployment of strategic nuclear weapons between the United States and Russia is set to expire on February 5, 2026.[12] President Putin proposed a one-year extension of the treaty; however, the United States has yet to respond to this proposal. The potential lapse of this final agreement raises profound concerns for global security. Without binding limits and verification mechanisms, the two largest nuclear powers would operate in an environment of heightened uncertainty, conditions that historically have fueled arms competition and strategic miscalculation.[13]

The current breakdown in U.S.-Russia relations has been made more complicated by the conflict in Ukraine, suggests that restoring meaningful arms control dialogue will require sustained diplomatic effort. The international community must also consider the risk on global security of a potentially destabilized and disintegrated Russia, which is a nuclear-armed state under prolonged isolation and internal pressures.

Proactive engagement is therefore essential, both to preserve the remaining arms control framework and to prepare for the proliferation risks that may arise from an increasingly unstable nuclear power.

Nuclear Security Dilemma and Combating WMD Proliferation Threats: The Policy and Role of China Since the Cold War Era

The People's Republic of China occupies a unique position in the global nuclear order. Over the past few decades, China has emerged as a major economic power. This transformation was accompanied by the modernization and expansion of its military capabilities as well. As a recognized nuclear weapon state, China acceded to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) in 1992, thereby affirming its commitment to the international non-proliferation regime.

China's nuclear doctrine distinguishes it from the other major nuclear powers. Since acquiring nuclear weapons in 1964, China has maintained a declared policy of no first use, pledging that it will not employ nuclear weapons unless first attacked with such weapons by an adversary. Among the five permanent members of the United Nations Security Council, China remains the only state to have upheld this policy unconditionally.[14] Furthermore, China has provided an unqualified negative security assurance to non-nuclear weapon states, committing not to use or threaten to use nuclear weapons against such states or against nuclear-weapon-free zones under any circumstances.[15] These declaratory policies reflect China's stated approach to nuclear deterrence, which emphasizes minimum deterrence, as well as the defensive nature of its nuclear arsenal.

China's nuclear posture reflects its declaratory commitment to minimum deterrence. In practice, this doctrine shapes operational procedures: China typically stores nuclear warheads separately from their delivery systems, mating them only when threat levels are elevated. This approach enhances survivability while signaling the defensive orientation of China's nuclear forces.

Over the years, Beijing has gradually increased transparency regarding its nuclear policies. The 2010 Defense White Paper articulated China's no first use commitment and outlined several stages of nuclear alert, while the 2011 edition reaffirmed the principles of minimum deterrence and no first use.[16] These documents also called upon other nuclear weapon states to negotiate a treaty on mutual no first use. Nevertheless, despite this stated commitment to nuclear disarmament, China, along with the other recognized nuclear weapon states and most NATO members, declined to sign the 2017 United Nations Treaty on the Prohibition of Nuclear Weapons, which was a binding agreement aimed at the total elimination of nuclear arsenals.

There remains considerable debate among analysts regarding the trajectory of China's nuclear strategy. Some observers speculate that Beijing's ongoing nuclear modernization program may be oriented toward developing the capacity to shift from a strategy of minimum deterrence to one of limited deterrence. Under such a doctrine, China would need to target not only cities but also adversary nuclear forces, which would require a significant expansion of its deployed capabilities. However, as Alastair Johnston has noted, Chinese capabilities remain far below the levels that a limited deterrence posture would require.[17] A key element of China's modernization efforts is the development of a sea-based nuclear deterrent. According to the U.S. Department of Defense's 2013 report to Congress, the introduction of nuclear-powered ballistic missile submarines (SSBNs) will provide the People's Liberation Army Navy with its first credible second-strike capability at sea, enhancing the survivability and flexibility of China's nuclear forces.[18]

The precise size of China's nuclear arsenal has never been officially disclosed, but external assessments provide useful estimates. As of 2011, reports suggested that China possessed between 200 and 300 nuclear warheads.By 2015, analysts Hans M. Kristensen and Robert S.

[12] Sokov, Nikolai. End of New START: Short- and Medium-Term Options. Vienna Center for Disarmament and Non-Proliferation, January 2026. https://vcdnp.org/end-of-new-start/

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Norris estimated China's stockpile at approximately 260 warheads, of which roughly 190 were considered operationally deployed. Since then, this number has continued to grow steadily as part of China's broader nuclear modernization program.[19]

China's nuclear arsenal has evolved considerably since its first successful test in 1964. Drawing on both foreign assistance and indigenous technological development, Beijing progressed from its initial fission device to the production of thermonuclear weapons and by the 1980s, tactical nuclear warheads. According to assessments by the Federation of American Scientists, China is believed to possess at least six different types of nuclear payload configurations, ranging from 15-40 kiloton fission bombs and 20 kiloton missile warheads to 3-5 megaton thermonuclear warheads for both missiles and gravity bombs, as well as lower-yield warheads in the 200-300 kiloton range. China is also estimated to maintain approximately 150 tactical nuclear warheads deployed on short-range ballistic missiles and possibly cruise missiles.[20]

In terms of delivery systems, the U.S. Department of Defense's 2015 Annual Report to Congress assessed that China's nuclear-capable missile force included 50-60 intercontinental ballistic missiles (ICBMs), alongside a substantial inventory of short-range ballistic missiles (SRBMs). China has undertaken significant efforts to modernize these delivery systems, including a transition from liquid-fueled to more survivable solid-fueled missiles.[21]

China has also demonstrated its commitment to responsible nuclear governance through international cooperation. Following the March 11th, 2011 earthquake and tsunami that severely damaged Japan's Fukushima Daiichi Nuclear Power Plant, China dispatched experts from its National Nuclear Safety Administration (NNSA) to assist in assessing the crisis. This cooperative response illustrated Beijing's recognition that nuclear safety transcends national boundaries and reinforced its broader commitment to the international nuclear governance framework.

China's commitment to nuclear safety cooperation extends even to politically sensitive contexts. Despite longstanding tensions between China and Taiwan, rooted in the unresolved status of Taiwan following the Chinese Civil War. While Beijing maintains that Taiwan is part of China, Taiwan however operates as a self-governing entity, the two sides have established formal mechanisms for nuclear safety collaboration.[22]

In October 2011, representatives from both sides signed the Cross-Strait Nuclear Power Safety Cooperation Agreement in Tianjin: China was represented by the Association for Relations Across the Taiwan Straits (ARATS), while Taiwan was represented by the Straits Exchange Foundation (SEF), the semi-official bodies authorized by each side to conduct cross-strait negotiations. Under this agreement, both sides committed to sharing information on nuclear power plants, regulations and safety standards, nuclear incident communications, environmental radiation monitoring, and emergency preparedness and response.[23] This arrangement demonstrates that shared concerns over nuclear safety can transcend political divisions, reinforcing the broader principle that effective nuclear governance requires cooperation across boundaries, which is a foundation essential to the non-proliferation regime.

Cooperative Frameworks for Combating WMD Proliferation: The CTR Program and GTRI

Cooperative Threat Reduction (CTR) program:

The Cooperative Threat Reduction (CTR) program, commonly known as the Nunn-Lugar Program after its sponsors, represents one of the most significant multilateral initiatives in the history of nuclear non-proliferation. The program was developed by U.S. Senators Sam Nunn (Democrat, Georgia) and Richard Lugar (Republican, Indiana), whose bipartisan collaboration demonstrated that nuclear security transcends partisan divisions. The Nunn-Lugar legislative act, signed into law on November 12, 1991, established a framework for providing financial and technical assistance to Russia and other newly independent states of the former Soviet Union to secure and dismantle their nuclear arsenals during the critical transition period following the Cold War.

The program's core objectives encompassed the destruction of chemical, biological, and nuclear weapons, as well as the transportation, storage, and safeguarding of weapons materials pending their elimination. Equally important was the establishment of verifiable safeguards against the proliferation of such weapons to state and non-state actors. With an initial allocation of approximately 4 billion dollars, the CTR program addressed urgent concerns about the security of the vast Soviet nuclear arsenal amid the political and economic instability that characterized the post-Soviet space.[24]

Over two decades of implementation, the CTR program achieved remarkable results. According to official assessments, the program facilitated the deactivation of 7,519 nuclear warheads and the destruction of 768 intercontinental ballistic missiles (ICBMs), 498 ICBM silos, 148 mobile ICBM launchers, 651 submarine-launched ballistic missiles (SLBMs), 476 SLBM launchers, 32 ballistic missile submarines, 155 strategic bombers, 906 air-to-surface nuclear missiles, and 194 nuclear test tunnels. Additionally, 469 train shipments transported nuclear weapons to more secure centralized storage facilities. The program also purchased 500 metric tons of highly enriched uranium (HEU) from dismantled warheads for conversion into civilian reactor fuel, effectively preventing this material from falling into the hands of proliferators.[25]

[19] Kristensen, Hans M., and Robert S. Norris. Chinese Nuclear Forces, 2015. Bulletin of the Atomic Scientists, Vol. 71, No. 4 (July 2015), pp. 77-84. https://thebulletin.org/2015/07/chinese-nuclear-forces-2015/

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[23] World Nuclear Association. Nuclear Power in Taiwan. https://world-nuclear.org/information-library/country-profiles/others/nuclear-power-in-taiwan

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[25] Nuclear Threat Initiative. Cooperative Threat Reduction Program to Expand Mission. January 27, 2010. https://www.nti.org/gsn/article/cooperative-threat-reduction-program-to-expand-mission/

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Perhaps most significantly, the CTR program played a decisive role in the complete removal of nuclear weapons from Ukraine, Kazakhstan, and Belarus, states that had inherited the world's third, fourth, and eighth largest nuclear arsenals respectively following the dissolution of the Soviet Union. This achievement eliminated the prospect of three new nuclear-armed states emerging in a region of considerable geopolitical uncertainty. The CTR program has defined its ongoing mission as preventing proliferator states and terrorist organizations from developing or acquiring weapons of mass destruction and delivery systems that could threaten international security.[26]

The Global Threat Reduction Initiative (GTRI):

The Global Threat Reduction Initiative (GTRI) was established by the United States Department of Energy in May 2004 as a complementary program to the Cooperative Threat Reduction initiative. While the CTR focused primarily on securing nuclear weapons materials in states of the former Soviet Union, the GTRI addressed a broader challenge; securing vast stocks of dangerous nuclear materials dispersed across civilian facilities worldwide. The program's core mission involved repatriating vulnerable nuclear fuel from peaceful-use facilities, converting research reactors to use of more proliferation-resistant technology, and ensuring that fissile materials could not be diverted for malicious purposes.[27]

The necessity for the GTRI emerged from the unintended consequences of earlier efforts to promote peaceful nuclear technology. Programs such as Atoms for Peace Initiatives coordinated through the International Atomic Energy Agency (IAEA), and commitments under the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) had assisted non-nuclear weapon states in acquiring civilian nuclear capabilities. However, many of these facilities operated using highly enriched uranium (HEU), which could potentially be diverted to construct a crude nuclear device. Recognizing this vulnerability, the GTRI sought to convert research reactors from HEU to low-enriched uranium (LEU) fuel, which cannot be readily used for weapons purposes. The program also worked to secure medical isotope production facilities that utilized HEU, thereby reducing the prospect of terrorists acquiring materials suitable for radiological dispersal devices, commonly known as “dirty bombs.”

The CTR and GTRI together represent significant achievements in cooperative non-proliferation efforts. However, as nuclear historian Joseph Siracusa observed, the broader challenge of arms control remains formidable. Despite the considerable diplomatic effort invested in negotiating nuclear treaties, compliance has proven inconsistent, with several agreements disregarded on various occasions. As Siracusa noted, “Building the bomb was always going to be easier than finding the means of harnessing it.”[28] This observation underscores the enduring tension at the heart of nuclear governance: technological proliferation consistently outpaces the institutional mechanisms designed to contain it.

CONCLUSION

This study has examined the nuclear security dilemma and the efforts of the United States, Russia, and China to combat weapons of mass destruction proliferation through international treaties, bilateral agreements, and cooperative initiatives. The analysis reveals both significant achievements and persistent challenges that continue to shape the global nuclear order.

The nuclear security dilemma, which emerged during the Cold War confrontation between the United States and the Soviet Union, remains a defining feature of contemporary international relations. The pursuit of nuclear security by one state invariably generates insecurity in others, perpetuating a cycle of armament and mistrust that proves exceedingly difficult to escape. This dynamic has manifested not only between the major nuclear powers examined here but also in regional contexts, most notably the India-Pakistan nuclear rivalry.

Each of the three major powers has adopted distinct approaches to managing this dilemma. The United States has pursued a dual-track policy combining diplomatic engagement through multilateral treaties with military measures including missile defense and economic sanctions. Although this approach has been marked by tension between non-proliferation commitments and strategic imperatives. Russia, as the successor to the Soviet nuclear arsenal, initially engaged constructively in post-Cold War arms control but has increasingly reasserted nuclear capabilities in response to perceived threats from NATO enlargement and U.S. missile defense. China has maintained its distinctive posture of no first use and minimum deterrence while gradually modernizing its nuclear forces, and demonstrating through initiatives such as the Cross-Strait Nuclear Power Safety Cooperation Agreement that nuclear governance can transcend political divisions.

The historical record examined in this study demonstrates that meaningful progress in reducing nuclear dangers is achievable, but only when the major powers summon the political will to pursue it.

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