# We Can't Go On Like This:
# A Proposal for Nonproliferation with Analysis of the Current Nuclear State of the World

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**Summary**

Our world in the 21st century continues to be shaped by the dangers of nuclear hostility. In this paper, we first introduce the status of nuclear arsenals around the world and the role of that status in defining state policy. We next examine the past efforts for international cooperation and the obstacles that have prevented denuclearization. We subsequently propose a solution to foster a more connected and engaged community through education, youth empowerment, and diplomacy as a starting point for real-world change.

## I. Introduction

Our world in the 21st century continues to be shaped by growing dangers of nuclear confrontations: the escalating tension between India and Pakistan, the increasing unpredictability of the Middle East conflict, the growing distrust between the U.S. and Russia as they walk away from bilateral treaties, and the failing efforts for a possible agreement with North Korea on a denuclearization goal. With all the twists and turns amongst all the players, it is surprising that we have managed to keep the world safe and away from a nuclear war for over seventy years after the Hiroshima and Nagasaki disasters. Indeed, some nuclear weapon possessing states continue to believe in nuclear deterrence as a priority in their defense plans. Current leaders in the world do not always act rationally, and there is a major challenge in keeping nuclear weapons secure from terrorists. Moreover, in this age of technological advancements, artificial intelligence and computing capabilities are slowly changing the art of warfare. Although the danger of nuclear war is very real, memories of the indiscriminant devastation of the bombings of Hiroshima and Nagasaki and the humanitarian impact seem to be fading away.

In this work, we begin by introducing the major holders of nuclear weapons. We next discuss important events regarding nuclear weapons in the world. We subsequently connect nuclear weapons to the modern era and discuss the role they play in today's society. In doing so, we introduce some of the largest issues regarding these weapons that face the world today. We also highlight obstacles to denuclearization and the struggles that advocates of nonproliferation have faced. We finally discuss existing legislation regarding nuclear policy. While only limited attempts have been made, and even fewer have been fully enforced, it is encouraging that we are attempting to move towards nonproliferation. Following the legislation is a discussion of the potential negative impact of nuclear weapons. With such powerful technology, there is always a risk of major issues that could be devastating for everyone on the planet. We conclude by proposing our own solution to the problem.

In aggregate, the goal of our proposal is to create a more connected society in which nations can cooperate on nonproliferation. We also strive to ensure that more young people are aware of the issues surrounding nuclear nonproliferation. One of the largest issues facing nonproliferation is a lack of knowledge and desire to implement it; by informing others, we hope that the public will take a greater interest in nonproliferation. Our hope is that our proposal will be able to serve as a viable starting point to create real world change.

## II. History and current status of nuclear weapons

The current Non-Proliferation of Nuclear Weapons Treaty (NPT) Nuclear Weapon States (NWS) are China, France, Russia, U.S., and the UK. While these states' nuclear weapons are recognized

by the Treaty on the NPT, the treaty specifically delineates these states to eventually eliminate nuclear weapons.[1]

China began its program during the Korean War, has nuclear policies focusing on a no-first-use policy and the third line construction policy (to construct all essential industries within the country).[2] In total, China is estimated to have 280 total warheads.[3] France has a total of about 300 warheads and has undergone a recent revamping of nuclear weapons. It is a part of the Comprehensive Test Ban Treaty (CTBT), supports the Fissile Material Cutoff Treaty (FMCT), and is active in dismantlement efforts.[4] Russia, as of August 2018, has a total stockpile of 7,000 warheads. By 2026, it hopes to eliminate all legacy systems (from the Soviet Union).[5] The U.S. started its nuclear weapons program during World War II and carried out the nuclear bombings of Nagasaki and Hiroshima. It had the highest number of weapons in 1967 totaling 31,255. As of 2017, the estimated number of deployed war-heads is 1,740.[6] The United Kingdom had its first nuclear test on October 3, 1962 and its nuclear program was started by British scientist William G. Penney who worked on the Manhattan Project. Much of the UK's nuclear program is based on U.S. technology and has a strong partnership with the U.S.. As of 2015, the UK only has sea based nuclear forces.[7]

Non-NPT NWS are states that are not considered nuclear weapons states under the NPT. Typically, these states have declared possession of nuclear arms or are believed to be in possession of nuclear arms. The current global status includes India, Pakistan, Democratic People's Republic of Korea (DPRK), and Israel.

India and Pakistan have been embroiled in a decades-long tension over nuclear weapons starting in the 1970s when India tested its first nuclear device known as the "Smiling Buddha." Pakistan followed suit soon afterwards and ramped up its own nuclear program. Tensions reached a peak

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[1] The Center for Arms Control and Non-Proliferation, "Fact Sheet: Nuclear Non-Proliferation Treaty (NPT)," The Center for Arms Control and Non-Proliferation, last modified April 14, 2017, accessed March 24, 2019, https://armscontrolcenter.org/fact-sheet-nuclear-non-proliferation-treaty-npt/.
[2] Nuclear Threat Initiative, "Chinese Nuclear Weapons," Nuclear Threat Initiative, last modified April 2015, accessed March 24, 2019, https://www.nti.org/learn/countries/china/nuclear/.
[3] Kelsey Davenport and Kingston Reif, "Nuclear Weapons: Who Has What at a Glance," Arms Control Association, last modified June 2018, accessed January 14, 2019, https://www.armscontrol.org/factsheets/Nuclearweaponswhohaswhat.
[4] Nuclear Threat Initiative, "France," Nuclear Threat Initiative, last modified May 2016, accessed March 24, 2019, https://www.nti.org/learn/countries/france/nuclear/.
[5] Nuclear Threat Initiative, "Russia Country Overview," Nuclear Threat Initiative, last modified August 2018, accessed March 24, 2019, https://www.nti.org/learn/countries/russia/.
[6] Nuclear Threat Initiative, "United States," Nuclear Threat Initiative, last modified July 2017, accessed March 24, 2019, https://www.nti.org/learn/countries/united-states/.
[7] Nuclear Threat Initiative, "United Kingdom," Nuclear Threat Initiative, last modified August 2015, accessed March 24, 2019, https://www.nti.org/learn/countries/united-kingdom/nuclear/.

in 1998 when both parties demonstrated their prowess in a flurry of tests. Nevertheless, India has maintained a policy of no-first use as its nuclear doctrine for the past 20 years. Both countries are believed to have approximately 140 warheads in their arsenals.

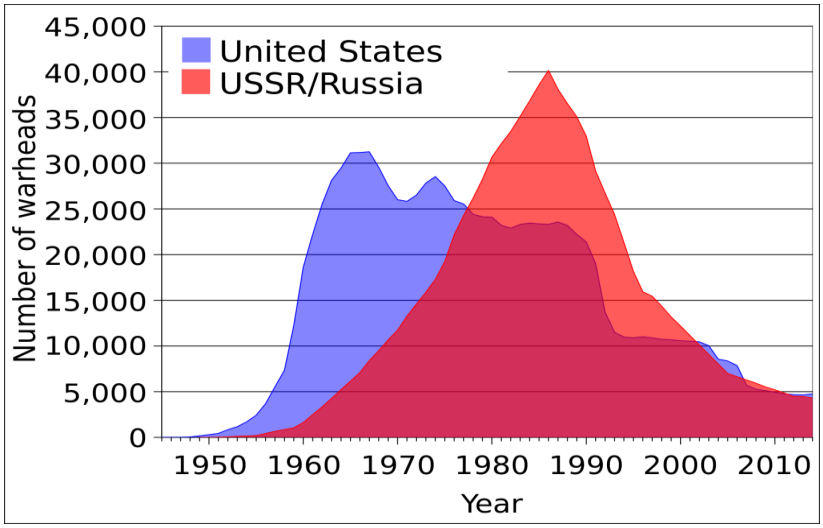
North Korea as a nuclear power has been a point of political focus ever since the Cold War. The government of the DPRK started developing nuclear technology in the 1950s, running dozens of tests in recent years. Most notably, the DPRK has detonated what is believed to be a thermonuclear device in 2017, causing criticism and disapproval among other international powers. Tensions are slowly being defused as U.S. President Trump and Chairman Kim met for the first time in 2018 and have just met again in another summit this past month. In total, North Korea is estimated to have 10-20 nuclear warheads available.

Israel is the most quiet about its nuclear weapons program. The country has not publicly tested a nuclear device or weapon and does not admit or deny possession. It is almost universally believed, however, that they have nuclear warheads, although Israel has stated that it will not be the first to introduce nuclear weapons into any conflict. Israel's arsenal is estimated to have around eighty active warheads.

**III. Current challenges & crisis**

The U.S. and Russia, being the two superpowers of the Cold War, have both agreed to reduce their nuclear arsenals and limit the types of permitted warheads. In 1987, the U.S. and the Soviet Union created the Intermediate-Range Nuclear Forces Treaty (INF), drastically cutting down the size of their respective stockpiles. As seen in the figure below, the reduction in the number of nuclear weapons has continued from the late 1980s to the present.

Nuclear Weapons Stockpiles of the US and the USSR/Russia since the 1940s




(http://foreignpolicynews.org/wp-content/uploads/2014/12/US-Russia-number-of-warheads.png)

The INF required the destruction of land-based ICBMs with a range of 500 to 5,500 km. By the 1991 deadline, the US and Russia had eliminated 2,692 missiles as a result.[8] However, recently, tensions surrounding the INF treaty have been escalating. In 2014, the United States alleged its first violation of the INF by Russia, and the claim was repeated in subsequent years. In 2019, the U.S. withdrew from the INF, claiming Russia was not abiding by the treaty, and Russia quickly withdrew reciprocally as well.[9] Just days after the announcement, Russia's defense minister announced his aim to create new land-based missiles in the next two years. It is reported that Russia could have already deployed one hundred of these missiles for new missile systems recently.[10]

The Joint Comprehensive Plan of Action (JCPOA) is the agreement between Iran and the P5 + 1 (China, France, Russia, United Kingdom, United States) plus Germany that was established on July 14, 2015 to limit Iran's nuclear capability by lifting economic sanctions.[11] The Iran deal was quite ambitious in its terms - reduce Iran's number of centrifuges from 19,000 to 6,000, limit the level of uranium enrichment to 3.67 % in Iran, reduce the stockpile of low-enriched uranium from 10,000 kilograms to 300 kilograms in Iran, remove and disable the heavy-water reactor at Arak, Iran, lift U.S. and EU economic sanctions, and allow international monitoring and verification by the International Atomic Energy Agency (IAEA).[12]

Even though Iran was holding its end of the deal, concerned with Iran's ability to continue enriching uranium, growth in Iran's military budget by 40% after the deal, Iran's continued support for Hezbollah and its interference in Iraq, Lebanon, Syria, and Yemen, President Trump announced U.S. withdrawal from JCPOA on May 8, 2018 by calling the Iran deal disastrous and an embarrassment.[13]

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[8] Daryl Kimball and Kingston Reif, "The Intermediate-Range Nuclear Forces (INF) Treaty at a Glance," Arms Control Association, last modified February 2019, accessed March 24, 2019, https://www.armscontrol.org/factsheets/INFtreaty.

[9] Department of State, Treaty Between The United States Of America And The Union Of Soviet Socialist Republics On The Elimination Of Their Intermediate-Range And Shorter-Range Missiles (INF Treaty), S. Treaty Doc. No. 100, 1st Sess. (Dec. 8, 1987). Accessed January 14, 2019. https://www.state.gov/t/avc/trty/102360.htm.

[10] BBC News, "INF nuclear treaty: Russia plans new missile systems after pullout," BBC, last modified February 5, 2019, accessed March 24, 2019, https://www.bbc.com/news/world-europe-47134028?SThisFB&fbclid=IwAR2vVJ8W6gnoQM9OEWCdIUI1eb0m311yVnicyK60QdHWeEMemq8IeTV7hXA.

[11] Kelsey Davenport, ed., "JCPOA at a Glance," Arms Control Association, last modified May 2018, accessed December 10, 2018, https://www.armscontrol.org/print/6372.

[12] Carol Morello and Karen DeYoung, "Historic Deal Reached with Iran to Limit Nuclear Weapon," *The Washington Post*, July 14, 2015, https://www.washingtonpost.com/world/historic-nuclear-deal-with-iran-expected-to-be-announced.

[13] Trump, President, "Remarks by President Trump on the Joint Comprehensive Plan of Action" (speech, May 8, 2018).

So far, the EU continues to mitigate the impact of U.S. sanctions and give its support to JCPOA by reactivating the Blocking Statute after U.S. reinstatement of economic sanctions on Iran. But only time will tell if the EU can incentivize Iran to adhere to the Iran deal. Will Iran show patience and wait for change in U.S. policy or use provocative measures? The U.S. has lost a lot of its trust by withdrawing from the deal, and this can turn Iran into an aggressor and increase chances of Iran developing nuclear weapons.[14]

*Saudi Arabia*

Saudi Arabia is a non-nuclear weapon state party to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) and has a Comprehensive Safeguards Agreement with the IAEA. Saudi Arabia has announced its intention to construct sixteen nuclear reactors to generate electricity by 2040 and is working on development of nuclear energy, power plants, and desalination reactors.[15]

Recently, Saudi Arabia has announced its intention of acquiring nuclear weapons if its chief regional rival, Iran, develops a nuclear weapon.[16] Hedge from Iran is Saudi Arabia's highest motivating factor in becoming a NWS. There are high proliferation risks involved in nuclear cooperation with Non-Nuclear Weapon States (NNWS) - it requires that the suppliers of nuclear fuel enforce an agreement that the NNWS would not work on sensitive nuclear technologies (enrichment and plutonium reprocessing).[17] In order to avoid this crisis, all potential suppliers must agree to only supply nuclear fuel and technology to Saudi Arabia for civilian nuclear cooperation.

*North Korea*

North Korea is a NWS with approximately sixty nuclear weapons; it withdrew from the NPT in 2003[18]. A rogue state with a keen desire to increase its nuclear capabilities, North Korea has been conducting ongoing long range missile testing to build a nuclear state. President Trump threatened to use "fire and fury" against North Korea in a UN speech in September 2017, and

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[14] Judy Dempsey, "Can the Iran Nuclear Deal be Rescued?," Carnegie Europe, last modified November 8, 2018, accessed January 10, 2019, https://carnegieeurope.eu/strategiceurope/77672.

[15] Sagatom Saha, "The US Must Build Saudi Arabia's First Nuclear Reactors," *Defense One* (blog), entry posted July 20, 2018, accessed March 1, 2019 https://www.defenseone.com/ideas/2018/07/us-must-build-saudi-arabias-first-nuclear-reactors/149914/.

[16] Emily Landau and Shimon Stein, "Can the United States Prevent Saudi Arabia from Getting Nuclear Weapons?," National Interest, December 4, 2018, [Page #], accessed February 11, 2019, https://nationalinterest.org/feature/can-united-states-prevent-saudi-arabia-getting-nuclear-weapons-3781.

[17] Ibid

[18] Matt Stiles, "Trump Thanks North Korean Leader for Return of Remains of U.S. War Dead," Los Angeles Times, July 27, 2018.

later took to Twitter to call Kim Jong-Un the “Little Rocket man.” Since then, Kim and Trump have continued exchanging words about whose nuclear button is bigger and more powerful. Amidst such an unstable environment, South Korean President Moon Jae-in orchestrated a first ever summit between U.S. President Trump and North Korean leader Kim Jong-Un. Talks at the summit led to suspension of military exercises conducted by the U.S. and South Korea in the Korean peninsula. North Korea agreed to return and recover the remains of POWs in the Korean war. The agreement to work towards denuclearization, peace, and prosperity in the Korean peninsula was a historic move.

North Korea returned the remains of fifty five POWs in the Korean war to U.S. and agreed to work towards a goal of "complete, verifiable, irreversible, denuclearization" (CVID).[19] Furthermore, the White House participated in a second summit in late February 2019 in Hanoi between U.S. President Trump and Kim Jong-Un. It is encouraging to see the decline in the war of words while continuing with the economic sanctions against North Korea. Though there was no progress made at Hanoi and the summit ended with disappointing results, there is definitely an improvement of relations between the U.S. and North Korea.

*India-Pakistan*

South Asia is a nuclear hotspot. India maintains a "No First Use" doctrine but Pakistan has refused to adopt such a policy, stating that it would use "any weapon" in its arsenal to defend the country.[20] According to data from the 2018 Stockholm International Peace Research Institute, Pakistan has 140 to 150 nuclear warheads and India has 130 to 140.[21] Moreover, according to Peter Layton, a former Australian Air Force officer, "Pakistan has a strategic policy of delegating nuclear release approval down to lower level tactical units."[22] This creates a real danger of “loose nukes” where lower level commanders can exercise tactical nuclear weapons without truly understanding its implications.[23]

India and Pakistan have a history of very tense relationships and when the tension escalates there is always a possibility of a nuclear conflict. In retaliation to a Pakistan-based terrorist attack which killed forty six Indians in February 2019, India launched an airstrike on terrorist bases in

[19] Stiles, "Trump Thanks".
[20] Jack Herrera, "Could the Conflict between Pakistan and India to Nuclear War?," Pacific Standard, February 27, 2019, accessed March 1, 2019, https://psmag.com/news/could-the-conflict-between-pakistan-and-india-lead-to-nuclear-war.
[21] Brad Lendon, "Crisis May be Easing, but Nuclear Threat Still Hangs Over India and Pakistan," CNN, last modified March 4, 2019, accessed March 13, 2019, https://www.cnn.com/2019/03/01/asia/india-pakistan-military-balance-intl/index.html.
[22] Ibid
[23] Ibid

Pakistan territory.[24] Fortunately, the current situation between India and Pakistan has calmed down somewhat, but there is always a fear of the use of nuclear weapons. Use of diplomacy and international intervention, especially from the United States, is very critical in diffusing the regional tension and de-escalating the situation.

*Complacency*

As the memories of the humanitarian impact of prior horrific atomic bombings begin to fade after over seventy years, the biggest challenge we face in tackling the grave problem of nuclear weapons is complacency. The younger generation has not experienced the horrors of nuclear war: nuclear winter, black carbon rain, burns, radiation exposure, and cancer among other illnesses.

In order to combat this shift in mindset, we need a cultural change where we view nuclear weapons as a liability and not as an asset. Nuclear weapons make the world a dangerous place, but we seem to have developed a false sense of security of living with the nuclear bomb.

*Technology*

With advancement in technology, weapons are becoming smaller and more powerful. Artificial intelligence is providing new capabilities which can spur arms races or increase the chances of intentional or accidental nuclear risk. Autonomous drones and smaller warheads are able to cause mass destruction at significantly lower cost. Both the U.S. and Russia are in the process of modernization of their weapons. New technology could also give terrorists access to cheap, long-range autonomous weapons.

## IV. Current status and challenges with nuclear nonproliferation, disarmament, and prohibition

The NPT was introduced in 1968 by the UN and entered into force in 1970. According to Margaret Cosentino and Jessica Cox in *The Encyclopedia of Science, Technology, and Ethics*, the NPT is meant to foster the reduction of nuclear weapons globally and prevent further development of nuclear weapons. In particular, the NPT uses the distinction between Nuclear Weapons States and Non-Nuclear Weapons States: while Nuclear Weapons States can possess nuclear weapons with the treaty, Non-Nuclear Weapons States must actively stop and reduce proliferation. Eventually, Nuclear Weapons States should stop proliferation as well. Thus, the treaty indicates a movement towards global denuclearization.[25] In a discussion of nuclear policy,

[24] Ben Brown, "White House Warns Pakistan: Aggression Against India 'Not Acceptable' as Nuclear Tensions Flare," CCN, March 21, 2019, accessed March 23, 2019, https://www.ccn.com/white-house-warns-pakistan-aggression-against-india-not-acceptable-as-nuclear-tensions-flare.

[25] Jessica L. Cox and Margaret Cosentino, "Nuclear Non-Proliferation Treaty," in *Encyclopedia of Science, Technology, and Ethics*, ed. Carl Mitcham (Detroit: Macmillan Reference USA, 2005), 3:[Page

it is important to recognize the NPT and evaluate it with the aim to deal with the spread of nuclear weapons. For obvious reasons, broader reform is necessary when it comes to denuclearization, but the NPT is, nevertheless, an important part of global nuclear policy.

The Treaty on the Prohibition of Nuclear Weapons (TPNW) is a legally binding agreement banning the possession, development, and deployment of nuclear weapons with the ultimate goal of totally eliminating them; it requires ratification by fifty countries to come into effect. The TPNW was adopted in July 2017 and as of March 21, 2019, seventy countries have signed the TPNW and twenty one have ratified it.[26] The ultimate goal of the TPNW is to achieve zero nuclear weapons. The terms of the TPNW are that state parties are prohibited to use, threaten to use, develop, produce, manufacture, acquire, possess, stockpile, transfer, station, or install nuclear weapons or assist with any prohibited activities. Unfortunately, the TPNW continues to be boycotted by the NWS, who claim that the TPNW will undermine the NPT. Moreover, NWS and their allies depend on nuclear weapons in their security policy and use them for deterrence. The NNWS frustrated with the slow pace of disarmament efforts by NWS are strong advocates for the TPNW and believe that the TPNW reinforces the NPT. The Austrian Labor party has committed to joining and ratifying the treaty once it forms a government.[27] However, Sweden has stated that they would not be able to join the treaty in its current form in the report commissioned by Sweden as they would face difficult relations with NATO countries on defense and security by joining the treaty.[28] Some of the open issues surrounding the treaty revolve around encouraging cooperation from NWS, need for unambiguous wording in the treaty, and broadening the definition of testing and requirements of uniform safeguards by including the adoption of Additional Protocol verification. TPNW is a historic treaty, and we need stronger efforts to facilitate its entry into force.

*2018 Nuclear Posture Review*

The Nuclear Posture Review is an extremely impactful report created by the Pentagon at the discretion of the United States President. The Review contains the perspective from the current

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[26] "Treaty on the Prohibition of Nuclear Weapons: Status of the Treaty," United Nations Office for Disarmament Affairs, last modified March 21, 2019, http://disarmament.un.org/treaties/t/tpnw.

[27] "Australian Labor Party Commits to Joining Nuclear Ban Treaty," International Campaign to Abolish Nuclear Weapons, last modified December 18, 2018, http://www.icanw.org/campaign-news/australian-labor-party-commits-to-joining-nuclear-ban-treaty/.

[28] "Sweden's New Government and Its Possible Consequences for Swedish Defence and Security Policy," *RKK International Center for Defense and Security* (blog), entry posted January 31, 2019, https://icds.ee/swedens-new-government-and-its-possible-consequences-for-swedish-defence-and-security-policy/.

U.S. administration on global nuclear proliferation. It also contains key information on how the U.S. plans to react and respond. The 2018 Nuclear Posture Review brought about four new changes in how the U.S. plans to operate its nuclear arsenal. First and foremost, the U.S. will prioritize low-yield nuclear weapons. This is incredibly important because of the tendency for adversaries to believe that the U.S. will respond to nuclear attacks with approximately the same amount of force, as calculated by the level of destruction. Since the U.S. nuclear inventory contains only high-yield nuclear weapons and conventional non-nuclear weapons, the United States may respond with too much or too little force in the status-quo. However, the Nuclear Posture Review calls for a change towards that policy by prompting the government to develop nuclear weapons with under 20 kilotons of explosive yield. For comparison, the disaster at Hiroshima was about 15 kilotons. These weapons, the Review states, should be equipped on submarine-launched ballistic missile warheads. Secondly, the U.S. also rejects the two traditionally important ideals of "sole purpose" and "no first use". The U.S. shares the point-of-view that nuclear weapons may be used in response to non-nuclear attacks and that the U.S. may be the first to initiate a nuclear attack. Next, the Trump administration once again rejects the values of the Obama administration by proposing the development of sea launched nuclear-armed missiles in response to Russia violating the Intermediate-Range Nuclear Forces Treaty. Although there is no concrete cost estimate for such a plan, the report downplays the budgetary requirements. Finally, the Nuclear Posture Review continues the pattern of waiting for other nations to sign the Comprehensive Nuclear Test Ban Treaty before committing to signing the treaty as well. The U.S. also turns down the TPNW as unrealistic.[29]

Of course, this broad summary of changes overlooks a few other crucial developments. The underestimation of sea launched ballistic missiles, for example, is quite drastic when considering the numbers. The Review believes new efforts should take up only 6.4% of the budget at the highest costs, but the Congressional Budget Office associates such development with a $1.4 trillion cost over the next thirty years. The Nuclear Modernization Program is another example of U.S. hypocrisy, indicating that the 1.2 megaton B83 nuclear bomb will be kept available for use despite previous promises that it will be disposed. It also makes the broad assertion that U.S. nuclear weapons would serve as a good deterrent for both nuclear and conventional weaponry and would be suitable for securing allies in the future.[30]

[29] Brenna Gautam, "Summary of the 2018 Nuclear Posture Review," Lawfare Blog, entry posted February 9, 2018, accessed January 15, 2019, https://www.lawfareblog.com/summary-2018-nuclear-posture-review.

[30] "2018 Nuclear Posture Review Resource," Federation of American Scientists, last modified February 6, 2018, accessed January 15, 2019, https://fas.org/issues/nuclear-weapons/nuclear-posture-review/#1517582676593-947eeac5-7318.

Overall, the most recent Nuclear Posture Review is pessimistic of future arms control and seems to complicate the problem further by restarting Cold War-esque strategies for nuclear weapons management.[31]

**V. Nuclear risks**

Accidental nuclear wars pose a large risk in the modern world and its current instability. With thousands of weapons ready to be launched at a moments notice, an accident could quickly escalate through retaliation and retribution. False alarms have been occurring since the 1950s, with inaccurate identification of other countries launching nuclear weapons.[32] Over the past few decades, nuclear arsenals around the world have become more tightly integrated with automated systems, potentially leading to misplaced confidence. Command and control are very closely linked to computer programs, which sometimes misinterpret the sensor information. Though launching nuclear weapons takes enormous consideration because of mutually assured destruction, the accidental firing of a warhead has the potential to create massive international relations issues.[33]

Cyber attacks against nuclear weapons systems can cause catastrophic and unintended usage of warheads.[34] Another large risk regarding cyber security is the ability to steal sensitive information about the details of nuclear weapons and obstruct communication and control systems, ultimately causing greater risk of conflict. Vulnerability could jeopardize execution success and military decision making.[35] Recently, the U.S. has revealed secret programs that have undermined Iranian nuclear weapons tests. Although its success has never been publicly acknowledged, the launching of two Iranian satellites failed within minutes, and in total, 67% of orbital launches have failed (compared to 5% worldwide). The U.S. administration has seen remarkable similarities between the satellite launch systems and those necessary for nuclear

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[31] Ibid.

[32] Future of Life Institute, "Accidental Nuclear War: A Timeline of Close Calls," Future of Life Institute, last modified 2016, accessed March 24, 2019, https://futureoflife.org/background/nuclear-close-calls-a-timeline/.

[33] Patrick Tucker, "Risk of 'Accidental' Nuclear War Growing, UN Research Group Says," Defense One, last modified April 19, 2017, accessed March 24, 2019, https://www.defenseone.com/technology/2017/04/risk-nuclear-accidents-growing-un-research-group-says/137171/.

[34] Nuclear Threat Initiative, "Cyber-Nuclear Weapons Study Group," Nuclear Threat Initiative, accessed March 24, 2019, https://www.nti.org/about/projects/cyber-nuclear-weapons-study-group/.

[35] Beyza Unal and Patricia Lewis, "Cybersecurity of Nuclear Weapons Systems: Threats, Vulnerabilities and Consequences," Chatham House, last modified January 11, 2018, accessed March 24, 2019, https://www.chathamhouse.org/publication/cybersecurity-nuclear-weapons-systems-threats-vulnerabilities-and-consequences.

warheads, and it appears the U.S.'s cyber program has played a role in weakening Iran's projectile program.[36]

**VI. Policy Recommendations**

While on the one hand we have seen warming of ties and increasing dialogue amongst nations that do not trust each other, on the other hand we have also seen treaties and agreements broken. Despite friction, we all have an inherent motivation to work with closer cooperation to address the nuclear threat. We need to drive a cultural change where nuclear weapons are considered liabilities, and not assets. According to Dr. William Perry, former U.S. Secretary of Defense, deliberative preemptive strikes are not likely, but there is grave danger of blundering into nuclear war. We have fortunately avoided nuclear crisis for over 70 years, but deterrence has worked more by luck and we need to avoid accidental detonation of nuclear weapons. We need to be educated, generate awareness about the Nuclear Threat Initiative, empower the youth and inform the public. We hope that we can all come closer, build relationships, and work together in a pragmatic way towards the goal of nuclear nonproliferation for a peaceful future for mankind. In this section, we propose traditional and innovative approaches to nonproliferation to reduce the threat of nuclear weapons.

*Education*

One of the ways to handle complacency is through education. Indeed, since of the largest problems facing nonproliferation is a lack of public knowledge on the dangers of nuclear weapons, we propose implementing a program for educating the public on nuclear threats. By integrating nuclear awareness into school curricula and history classes, we can move towards being a world that knows about and actively searches for solutions to avoid nuclear weapons. Once the public has knowledge about nuclear weapons and denuclearization, we are confident that there can be real change; for example, in the U.S., local citizens can contact government representatives to start a Congressional discussion on reducing and eliminating nuclear weapons. Global citizens may know what nuclear weapons are, but many do not know the true impact that they can have on the world; thus, they may not see nuclear proliferation as a major problem that needs to be acted against. Education regarding nuclear weapons can help change the way in which the world views nuclear weapons and can promote action for denuclearization.

*Information (citizen engagement and awareness, holding leaders accountable)*

In order to improve civic engagement in advocating for nuclear non-proliferation, governments of countries such as North Korea should encourage the accurate communication of nuclear risks and development and recognize that the benefits of peace outweigh continued nuclear

[36] David E. Sanger and William J. Broad, "U.S. Revives Secret Program to Sabotage Iranian Missiles and Rockets," New York Times, last modified February 13, 2019, accessed March 24, 2019, https://www.nytimes.com/2019/02/13/us/politics/iran-missile-launch-failures.html.

development. Additionally, the international community must continue to spread awareness and bolster trust in diplomatic negotiations.

*Youth empowerment*

Nuclear arsenals will no doubt be present in the future of global diplomacy and interactions, and with instability on the rise, it is more important now than ever that the youth of the world take a proactive role in understanding and engaging in nuclear nonproliferation. It is crucial for international organizations to promote youth empowerment through conferences and summits. Such meetings including the Critical Issues Forum and the International Youth Summit for Nuclear Abolition (hosted by the United Nations Office of Disarmament Affairs) are key to raising youth awareness and improve the engagement of our society's future regarding nuclear usage and tensions.

*Diplomacy*

Engaging in conversations and talks with countries with whom you do not agree is not a sign of weakness. It is important to keep diplomacy in the forefront especially when agreements and treaties are broken. Talking is a more effective tool than exchanging hostile words, breaking treaties and walking away from agreements. Among the most critical objectives are to re-foster US-Russia diplomacy and engage with non-NPT NWS countries and recognize their nuclear capabilities.

*Science Diplomacy*

Science diplomacy, the use of scientific collaboration for international relations, is an incredibly important tool suffering from lack of effective utilization. Either in parallel with Track I (official government to government communication) or when Track I talks fail, Track II (unofficial interaction and intervention) diplomatic efforts, scientific diplomacy can result in significant breakthroughs when things are at an impasse. When traditional routes of government-to-government talks are deeply divided with mistrust and war of words, such an augmentation of Track II diplomacy can help bridge the gap, improve relationships, foster communication and increase cooperation by providing objective analysis and informed decision-making. Indeed, we have seen the results of effective science diplomacy during the Cold War with cooperation between U.S.-USSR scientists which helped to reduce tensions during a very difficult time between the two rival countries and began an era of scientific cooperation between the two countries.[37] Unfortunately, loss of government support, funding, travel, and visa restrictions have created hurdles for scientific partnerships.[38] Research and

[37] Cathy Campbell, "Is it Time Again for Science Diplomacy with Russia?," Medium, last modified July 13, 2018, accessed February 13, 2019, https://medium.com/sciencediplomacy/is-it-time-again-for-science-diplomacy-with-russia-2930f87d44c1.
[38] Ibid.

collaboration among scientists, consultations, and exchanges can help defuse the rising tensions between the U.S. and Russia. It is important for scientists to keep open lines of communication and open doors to promote cooperation and prevent conflict. In today's technologically advanced world, science diplomacy is a very promising tool for our safer future.

*Reaffirming international cooperation*

Treaties and agreements are crucial in promoting dialogue, reducing uncertainty, improving stability and building confidence. The U.S. withdrawal from the JCPOA agreement is not considered a responsible policy. Even though the Iran deal did not halt Iran's nuclear ambitions nor did it address Iran's development of ballistic missiles and Iran's ability to nuclear breakout in a short period of time, the deal, in spite of its shortcomings, was able to keep a close eye on Iran's nuclear ambitions. Indeed, a balance between sanctions and regional cooperation can go a long way in negotiations between countries with a long history of rogue behavior and mistrust. Verification is the key to keeping a close eye on the developments of rogue nations. Efforts should also be made to include human rights and foreign policy concerns in negotiations with Iran.

The key to facilitate progress in bringing TPNW into force is to bring NWS into open discussions, and engaging them in peace talks. If we can bring entry into force of the TPNW, we can look forward to a world without nuclear weapons and free of nuclear disasters. There should be grassroots movements to support TPNW and to put pressure on political leaders as it is the moral and ethical thing to do. The hypocrisy of NWS states holding on to their nuclear weapons while requiring the NNWS to remain non-nuclear is not a sustainable policy.

Stricter controls must be in place for enforcement of 123 agreements or bilateral pacts, which govern the sale of nuclear technology to any NNWS. 123 agreements require adherence to nine proliferation criteria, preventing other countries from acquiring nuclear capability.

*Cyber Security*

Launch on warning is complicated with cyber danger. In today's world exploding with social media and cyber threats there should be no first use of nuclear weapons and an end to hair-trigger alerts of nuclear weapons and missiles.

*Cultural change*

While NWS truly believe that use of nuclear weapons as deterrence is the best insurance policy, we need to change the mindset that it is possible to achieve security and keep everybody safe with denuclearization and demilitarization. Nuclear weapons are not an asset but a liability.

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