

NUCLEAR WEAPONS PROLIFERATION

Global Risk Background Paper

"It is becoming clearer that nuclear weapons are no longer a means of achieving security; in fact, with every passing year they make our security more precarious."

– Mikhail Gorbachev, Leader of the Soviet Union (1988-1991)

Introduction¹

While it has been more than twenty-five years since the end of the **Cold War**, the proliferation, or spread of nuclear weapons, whether by **state** or **non-state actors**, continues to present one of the more complex and unpredictable threats to international security. Today, nine countries—China, India, Israel, France, North Korea, Pakistan, Russia, the United Kingdom, and the United States—hold an estimated 15,400 nuclear weapons.



George H.W. Bush (U.S.) and Mikhail Gorbachev (U.S.S.R.) signed the Strategic Arms Reduction Treaty (START I) in July 1991. The treaty prevented these Cold War adversaries from deploying more than 6,000 nuclear warheads. Source: TIME.

Currently, the presence of large stockpiles of nuclear weapons makes the accidental or unauthorized use of nuclear weapons a persistent risk. In addition, many of the countries with smaller **nuclear arsenals**, such as India and Pakistan, are engaged in regional conflicts, making the possibility of regional nuclear war a real concern. North Korea illicitly acquired nuclear weapons, and other countries, including Iran and Syria, have violated their nuclear safeguards commitments and have at various times been known to pursuing nuclear weapons capabilities.

Additionally, nuclear technology and the know-how to build a bomb is no longer a **monopoly** controlled by states. The A.Q. Khan black market nuclear network in Pakistan highlighted the real possibility that a terrorist group or a so-called **rogue state** could acquire **weapons of mass destruction (WMDs)** or materials for a **dirty bomb**.² The threat of **cyber-terrorism** is also a real risk that has experts working to keep up with cyber vulnerabilities that could be exploited by hackers to initiate a catastrophe. Consequently, the international community will need to update and reinforce aging agreements in order to contain these new threats, and pave the way for the "peace and security of a world without nuclear weapons."

¹ This section was excerpted and adapted from the [Nuclear Threat Initiative's website](#). (2017).

² In February 2004, Dr. Abdul Qadeer Khan (commonly referred to as A.Q. Khan), considered the father of Pakistan's nuclear bomb, admitted that he had transferred sensitive nuclear technology to Libya, Iran, and North Korea. Dr. Khan's statement was a significant breakthrough for international efforts to uncover a secret network involved in illegal trading of nuclear technology. "Uncovering the Nuclear Black Market: Working Toward Closing Gaps in the International Nonproliferation Regime," By David Albright and Corey Hinderstein Institute for Science and International Security (ISIS).

Today's Nuclear Weapons³

Nuclear weapons release enormous amounts of energy through either **fission** (the splitting of heavy atoms such as **uranium** or **plutonium** in a chain reaction), **fusion** (the combining of isotopes of an element such as hydrogen) or both, in the case of **modern thermonuclear weapons**. The U.S. nuclear bombs that destroyed Hiroshima and Nagasaki in 1945 were simple fission weapons that used **highly enriched uranium (HEU)** and plutonium, respectively.

Most of the thermonuclear weapons in today's arsenals have an explosive yield roughly 8 to 100 times larger than the bombs dropped on Hiroshima and Nagasaki, which averaged the equivalent of 18,000 tons of TNT. Modern nuclear weapons typically contain both HEU and plutonium. The **warheads** are generally deployed for delivery on land- or submarine-based **ballistic missiles**, air- or surface-launched **cruise missiles**, or gravity bombs aboard strike aircraft and bombers. Nuclear weapons have been previously deployed for delivery by short-range rockets and artillery, sea mines, torpedoes, and **depth charges**. Warheads in some modern arsenals can be delivered to any point on the earth with great accuracy.

For those seeking to develop nuclear weapons, the production of fissile materials (most commonly HEU and plutonium) is the main technical challenge. Nonetheless, the amount of fissile material needed to make a nuclear weapon is not large. The **International Atomic Energy Agency (IAEA)** defines a "significant quantity" of fissile material as the amount for which the possibility of manufacturing a nuclear explosive device cannot be excluded. The significant quantities are 25 kilograms (approx. 55 lbs.) of **Uranium-235** contained in HEU, 8 kilograms (approx. 17 lbs.) of plutonium, and 8 kilograms (approx. 17 lbs.) of **Uranium-233**.

Nuclear-Weapon States and Forces⁴

The number of nuclear weapons worldwide peaked in the mid-1980s at around 70,000 warheads. With the end of the Cold War, the number of nuclear weapons has been significantly reduced, yet they continue not only to exist, but also to be central to the security doctrines of those states that possess them.

At the start of 2016, there were approximately 4,120 nuclear weapons deployed and ready for use globally, according to the Stockholm International Peace Research Institute (SIPRI).⁵ In 2015, almost 1,800 of these are reportedly kept on high alert, ready to be launched within minutes. In total, there are an estimated 15,395 nuclear weapons (operational, spares, active and inactive storage and intact warheads scheduled for dismantlement).⁶

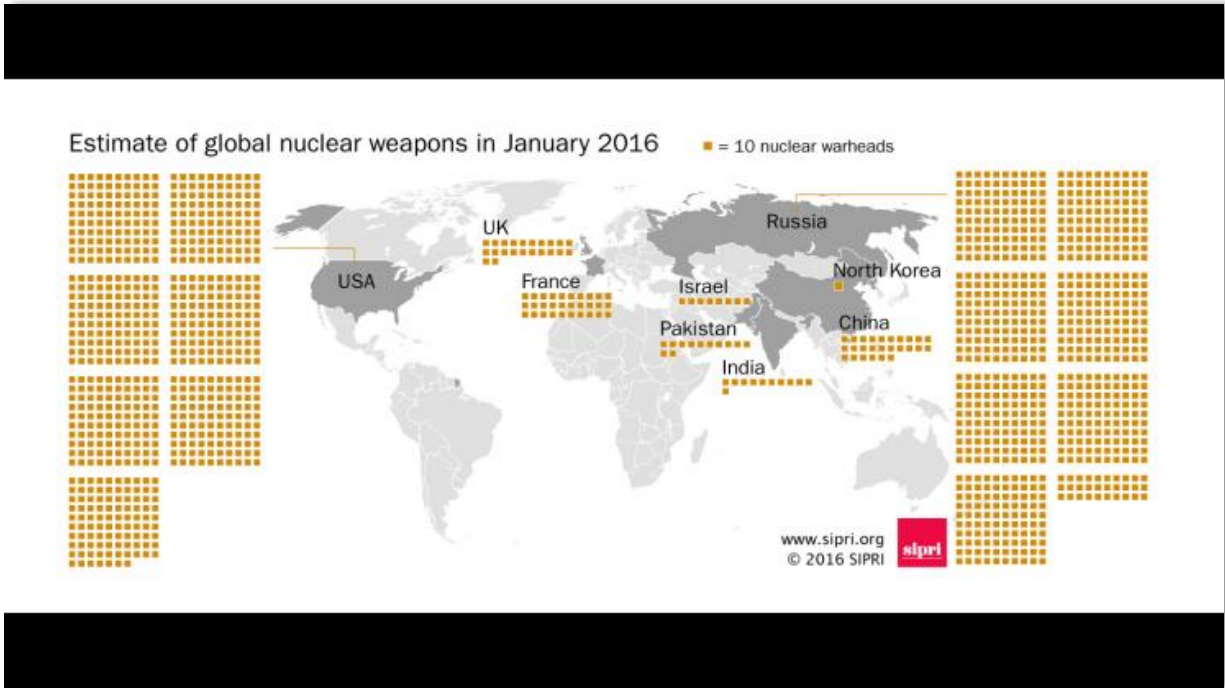
The **Treaty on the Non-Proliferation of Nuclear Weapons (NPT)**, the key international agreement that aims to prevent the spread of nuclear weapons and technology, defines five states as nuclear-weapon states: China, France, the Russian Federation, the United Kingdom, and the United States. Of these, the United States, the Russian Federation, France, and the United Kingdom have been reducing their deployed arsenals from Cold War levels. According to SIPRI (2011), however, all are either deploying new nuclear

³ This section was excerpted from [Disarmament: A Basic Guide](#). United Nations, New York. 2012.

⁴ This section was excerpted from [Disarmament: A Basic Guide](#). United Nations, New York. 2012.

⁵ "Deployed" means warheads placed on missiles or located on bases with operational forces.

⁶ Data has been updated using the [Stockholm International Peace Research Institute's annual nuclear forces data](#) (June 2016).



Source: Stockholm International Peace Research Institute.

weapons systems or have announced their intention to do so. While they have publicly reaffirmed their commitments to nuclear disarmament, none appear ready to give up their nuclear arsenals in the foreseeable future.

The Russian Federation and the United States, with a combined total of more than 3,860 deployed warheads, possess the vast majority of the world’s nuclear arsenal (more than 90 per cent of deployed weapons). Since the 1980s, the two countries have negotiated a series of bilateral treaties aimed at reducing the number of nuclear weapons deployed by each. Their most recent agreement, the **Treaty on Measures for the Further Reduction and Limitation of Strategic Offensive Arms (New START)**, limits the two countries to 1,550 deployed strategic warheads each. The New START does not require the dismantlement of warheads taken off deployment. The United States has expressed a desire to include tactical weapons and strategic warheads held in reserve within the scope of its next arms reduction agreement with the Russian Federation.

As of 2008, the United States and the Russian Federation, along with the United Kingdom and France had officially announced a halt on their production of fissile materials for weapons. China, which may have kept its nuclear arsenal roughly constant for decades, is believed to have also ceased fissile material production, though it has not announced an official moratorium.

Regional Nuclear Issues⁷

Regional rivalries in the Middle East, Northeast Asia, South Asia, and elsewhere also pose clear and present nuclear dangers to global security. These rivalries raise the risk that a nuclear weapon might be

⁷ This section was excerpted from [Disarmament: A Basic Guide](#). United Nations, New York. 2012.

used in a deliberate attack, and the consequences of a regional nuclear exchange would reverberate across the globe.

South Asia

India and Pakistan have not joined the NPT and are presumed to be building their nuclear weapon stockpiles. Both countries have tested nuclear weapons and are believed to be continuing to produce fissile materials for use in nuclear weapons, as well as new nuclear-weapon delivery systems.

Northeast Asia

North Korea (DPRK) has tested nuclear explosive devices in 2006, 2009, 2013, and twice in 2016, prompting the adoption of a string of resolutions by the **United Nations Security Council**. Non-government estimates state that the DPRK may have enough weapons-grade plutonium for 5 to 12 weapons. **The Six-Party Talks** (involving China, Japan, North Korea, the Russian Federation, South Korea and the United States) continue to be the primary forum for negotiating the denuclearization of the Korean Peninsula, although no talks have been held since 2008.

Middle East

Since 1974, the **United Nations General Assembly** has endorsed the objective of establishing a zone in the Middle East free of nuclear weapons. No state in the region objects to such a goal. In 1995, as part of the decision to indefinitely extend the NPT, **United Nations member states** adopted a resolution that among other things called for all states in the region to take practical steps towards the establishment of an effectively verifiable Middle East zone free of nuclear weapons and all other weapons of mass destruction (WMDs)—chemical and biological—and their **delivery systems**. The 2010 NPT Review Conference reaffirmed this goal and called for the convening of a conference in 2012 on the establishment of such a zone.

Israel is the only state in the region not party to the NPT and is believed to possess nuclear weapons. According to the **International Panel on Fissile Materials (IPFM)**, Israel may be continue to produce fissile materials for use in nuclear weapons, although its nuclear arsenal may have been roughly constant for decades.

Lastly, the nuclear program of Iran continues to attract international attention. In 2015, negotiations between the **P5+1** (China, France, Germany, Russia, the United Kingdom, and the United States) and Iran yielded a nuclear agreement limiting Iran's nuclear capacity for the duration of the pact, in exchange for **sanctions** relief. On January 16, 2016, all nuclear-related sanctions on Iran were lifted under the terms of the deal.

Risks Posed by Nuclear Weapons⁸

The potential use of nuclear weapons represents a clear and present danger to humanity. The spread of nuclear know-how only adds to this danger. Former IAEA Director General, Mohamed ElBaradei, has stated, “In 1970 it was assumed that relatively few countries knew how to acquire nuclear weapons. Now, with 35-40 countries in the know by some estimates, the margin of security under the current **non-proliferation regime** is becoming too slim for comfort.” In addition, according to the Nuclear Threat

⁸ This section was excerpted from [Disarmament: A Basic Guide](#). United Nations, New York. 2012.

Initiative, more than 50 States each possess more than 5 kilograms (approx. 11 lbs.) of weapons-usable fissile material.

While many of the world's nuclear stockpiles are adequately guarded, there are concerns that some supplies, as well as other related nuclear materials, are insufficiently secured and vulnerable to theft. The IAEA maintains an **Illicit Trafficking Database (ITDB)** on incidents of illicit trafficking and other unauthorized activities involving nuclear and radioactive materials. The database tracks events that occurred intentionally or unintentionally, with or without crossing international borders, as well as unsuccessful or thwarted acts. Between the period of July 2009 to June 2010, 222 incidents were confirmed and included in the ITDB. During this period, five incidents involved HEU or plutonium, according to the IAEA.

An accidental launch of nuclear weapons is also still a real possibility, heightened by the fact that perhaps thousands of weapons remain on high alert, ready to be launched within minutes. Even supposing theft or mistaken launch does not occur, the costs related to nuclear weapons (to research, develop, build, maintain, dismantle and clean them up) are considerable. The United States spends \$30 billion per year just to maintain its stocks. A Brookings Institution study in 1998 put the overall cost of the United States nuclear weapons program between 1940 and 1998 at over \$5.5 trillion. And the United States Department of Energy reports that weapons activities have resulted in the production of more than 104 million cubic meters of **radioactive waste**.

Risks Posed by Nuclear Terrorism⁹

Today, there are more than 1,800 metric tons of weapons-usable nuclear materials stored in hundreds of sites across 25 countries, some of them poorly secured. Although non-state actors, such as terrorist groups, have never successfully acquired a nuclear weapon, documented attempts demonstrate some groups are interested in nuclear terrorism. To build a bomb, terrorists won't necessarily look to the biggest stockpiles; they'll go where nuclear materials are the most vulnerable. That makes global nuclear security only as strong as the weakest link in the chain. For example:

- **Al Qaeda** created a dedicated program to develop nuclear weapons led by Ayman al-Zawahiri, the group's current leader. Members of al Qaeda tried repeatedly to buy nuclear material or recruit nuclear experts, and according to the CIA obtained "a rough sketch of a nuclear bomb design" from two Pakistani nuclear scientists.
- The Japanese cult, **Aum Shinrikyo**, unsuccessfully attempted to obtain a complete warhead from contacts in Russia in 1992. After failing, the cult unsuccessfully sought to produce its own weapons-usable material, purchasing uranium mines in Australia and investigating uranium enrichment technologies.
- **ISIS** fighters tracked Belgium's nuclear power chief for weeks. Many suspect ISIS fighters were planning to kidnap him or a family member to gain access into a plant and gain nuclear material.

International Action

In 1957, United Nations member states created the International Atomic Energy Agency (IAEA), whose mission is to promote safe, peaceful uses of nuclear science. Authorized to conduct regular inspections of

⁹ This section was excerpted and adapted from the [Nuclear Threat Initiative's website](#). (2017).

civil nuclear facilities and monitor the movement of nuclear materials, the IAEA is considered to be the global center for cooperation in the nuclear field.

To further the work of the IAEA, the U.S., along with other like-minded states, negotiated the *Treaty on the Non-Proliferation of Nuclear Weapons (NPT)* in 1968 with the aim of deterring additional countries from pursuing nuclear weapons programs. While the treaty did not specifically require the existing nuclear powers to disband their nuclear programs, it did call on those countries to agree not to transfer nuclear weapons or weapons technology to non-nuclear states. Additionally, the Treaty further required all non-nuclear states to agree not to build or acquire nuclear weapons. At the time of its passage, the NPT was considered a milestone in the global community's effort to prevent the spread of nuclear weapons and weapons technology and to promote peaceful uses of nuclear energy.¹⁰ However, while several states subsequently abandoned their nuclear weapons programs, others persisted with their efforts.¹¹



Members of the P5+1 meet on the margins of the 2016 Nuclear Security Summit in Washington, D.C. Source: U.S. Department of State.

In 1974, India conducted its first nuclear test, followed, in 1998, by its long-standing regional adversary Pakistan. North Korea signed and approved the NPT in December 1985 but withdrew from the treaty in January 2003 and reported its first successful nuclear test in October 2006. And while its government has never officially admitted to having a nuclear weapons program, Israel, a non-signatory of the NPT, is widely believed to have an arsenal of nuclear weapons. Before the 2015 agreement, Iran is widely believed to have a nuclear weapons development program as well.

Moreover, as more countries look to develop alternatives to fossil fuel-based energy, many have turned to nuclear power to generate a sustainable source of electricity. And because the technology used to produce nuclear energy is closely connected to the technology used to produce nuclear weapons, there are more than thirty countries (including Japan, Germany, and South Korea) that are considered to have the technological ability to convert their nuclear power programs into viable nuclear weapons facilities.

Although the NPT did not ultimately prevent nuclear proliferation, it did set a precedent for international cooperation between nuclear and non-nuclear states. Additional bilateral and multilateral agreements have since supplemented the NPT, most notably the ***Comprehensive Nuclear Test Ban Treaty (CTBT)*** of 1996, ratified by 166 countries and intended to ban all nuclear weapons test explosions. While the five

¹⁰ The Treaty represents the only binding commitment in a multilateral treaty to the goal of disarmament by the nuclear-weapon states. Opened for signature in 1968, the Treaty entered into force in 1970. On 11 May 1995, the Treaty was extended indefinitely. A total of 190 parties have joined the Treaty, including the five nuclear-weapon States. More countries have ratified the NPT than any other arms limitation and disarmament agreement, a testament to the Treaty's significance.

¹¹ South Africa dismantled its nuclear program in 1989. Additionally, Belarus, Kazakhstan and Ukraine, all former Soviet republics, returned their stockpiles of nuclear weapons to Russia following the dissolution of the Soviet Union in 1991.

nuclear powers signed the treaty, neither the U.S. nor China have ever officially approved it. However, bilateral agreements, most notably between the U.S. and Russia, have continued. And while nuclear arsenals are unlikely to completely disappear, progress has been made. For example, by 2002, the number of deployable warheads in Russia and U.S. arsenals had dropped from 70,000 to around 30,000.

International Challenges

Most of the multilateral treaties created to prevent the proliferation of nuclear weapons are created for nation states. These agreements do not address individuals or transnational, non-state actors, such as extremist groups, ethnic **secessionist groups** and religious sects, all of whom could potentially—although not easily— acquire the knowledge, technology and materials to produce a weapon of mass destruction. Therefore, the challenge today centers on the convergence of terrorism with new and evolving weapons of mass destruction made possible by the globalization of technology and expertise. Sources for extremist groups to acquire the knowledge or nuclear-ready materials include states with a WMD program, like Pakistan, or from an academic or commercial group that is involved in nuclear, biological or chemical research or productions.

Questions to Consider

- 1) Why is the failure to address the spread of nuclear weapons and technology a pressing global risk? What challenges and/or opportunities exist for your economic bloc in addressing this risk?

- 2) Is the proliferation of nuclear weapons a high concern for your economic bloc? If so, what specific risks do nuclear weapons pose? If not, how might your economic bloc be affected by the impact of nuclear weapons in other blocs?

3) How would reducing the risks posed by nuclear weapons directly impact long-term economic stability and prosperity in your economic bloc?

4) What recent strategies or actions has your economic bloc taken to address the risks posed by nuclear weapons?

5) What specific type of action might be necessary to address the risk posed by nuclear weapons in your economic bloc?

6) Who should bear the primary responsibility for efforts to stop the spread of nuclear weapons in your economic bloc (governments, business and industry, individuals or private organizations)? How should roles and responsibilities be allocated among these groups?

7) If sufficient funding were available, what additional strategies would you implement to reduce and better respond to the risks posed by nuclear weapons in your economic bloc?

8) In what ways would addressing nuclear weapons reduce the impact and severity of the other global risks (climate change, rise of political populism, and unpredictability of oil prices)?

Further Resources

- Nuclear Threat Initiative
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Glossary of Terms

- **Al Qaeda:** a Sunni Islamist organization founded in 1988 by Osama bin Laden, Abdullah Azzam, and several other Arab volunteers who fought against the Soviet invasion of Afghanistan in the 1980s.
- **Aum Shinrikyo:** a Japanese cult combining elements of Buddhism, Hinduism, and Christianity, founded by Shoko Asahara in 1986; furthermore, it was responsible for a number of murders and in particular a nerve-gas attack on the Tokyo underground in 1995
- **Ballistic missiles:** a rocket that follows specific path with the objective of delivering one or more warheads to a preset target.
- **Cold War:** a period between 1947 and 1991 in which the threat of a nuclear war between the Soviet Union and the United States of America was an ever-present danger.
- **Comprehensive Nuclear Test Ban Treaty (CTBT):** states agree to ban all nuclear explosions in all environments, for military or civilian purposes
- **Cruise missiles:** a winged guided missile designed to deliver a conventional or nuclear warhead by flying at low altitudes to avoid detection by radar.
- **Cyber-terrorism:** the politically motivated use of computers and information technology to cause severe disruption or widespread fear in a society.
- **Delivery systems:** means of sending a WMD through, but not limited to, the following ways: ballistic and cruise missiles, combat aircrafts, and unmanned aerial vehicles.
- **Depth charges:** an anti-submarine warfare weapon. It is intended to destroy a submarine by being dropped into the water nearby and detonating.
- **Dirty bomb:** combines radioactive material with standard explosives. The purpose of the weapon is to contaminate the area around the explosion with radioactive material.
- **Fission:** the method of splitting the nucleus of an atom into two equal halves, which releases an unbelievable amount of energy.

- **Fusion**: the method of slamming two nuclei of atoms together at outrageous speeds, which creates a good deal of energy.
- **Highly enriched uranium (HEUs)**: Uranium that has been enriched past the 3-5 percent levels that is sufficient for a nuclear weapon.
- **Illicit Trafficking Database (ITDB)**: created in 1995, it contains information, which has been confirmed by the States involved, about incidents of illicit trafficking and other related unauthorized activities involving nuclear and other radioactive materials.
- **International Atomic Energy Agency (IAEA)**: seeks to promote the peaceful use of nuclear energy, and to inhibit its use for any military purpose, including nuclear weapons. Although it was created separate from the United Nations, the IAEA reports to both the Security Council and general assembly.
- **International Panel on Fissile Materials (IPFM)**: is an independent group of arms-control and nonproliferation experts from both nuclear weapon and non-nuclear weapon states. Its mission is to analyze the technical basis for practical and achievable policy initiatives to secure, consolidate, and reduce stockpiles of highly enriched uranium and plutonium.
- **Modern thermonuclear weapons**: a nuclear weapon that uses the energy from a primary nuclear fission reaction to compress and ignite a secondary nuclear fusion reaction.
- **Monopoly**: the exclusive possession or control of the supply or trade in a commodity or service.
- **Non-proliferation regime**: various multi-national organizations that create a framework for participating government to combat problems relating to export control and WMD proliferation. Individually, the regimes target specific threats including chemical and biological weapons, nuclear weapons, delivery systems, and conventional arms.
- **Non-state actors**: entities that do not belong to any established institution of a national government or state, which participate or act in international relations.
- **Nuclear arsenals**: the amount of nuclear weapons at a country's disposal, which are ready to be sent at a minute's notice.
- **P5+1**: refers to the UN Security Council's five permanent members working with Iran in order to work out a deal on its nuclear program.
- **Plutonium**: an element not only used in nuclear reactors but also a key component in nuclear weapons when enriched.
- **Radioactive waste**: a by-product of nuclear power generation and other applications of nuclear fission or nuclear technology.
- **Rogue state**: a controversial term applied by some international theorists to states they consider threatening to the world's peace. Currently, the U.S. has labeled Iran, North Korea, Sudan, and Syria as a rogue state.
- **Sanctions**: actions taken by countries against others for political reasons, either unilaterally or multilaterally. There are several types of sanction, which include diplomatic sanctions, economic sanctions and military sanctions.
- **Secessionist groups**: a group or movement that seeks to withdrawal from a larger entity, especially a political entity (a country), but also any organization, union, or military alliance.

- **State actors:** entities that act on behalf of a governmental body or belong to an established institution of a state.
- **The Six-Party talks:** aim to find a peaceful resolution to the security concerns as a result of the North Korean nuclear weapons program. The participating members are as follows: South Korea, North Korea, United States of America, China, Japan, and Russia.
- **Treaty on Measures for the Further Reduction and Limitation of Strategic Offensive Arms (New START):** Under the Treaty, the United States and Russia must meet the Treaty's central limits on strategic arms by February 5, 2018. This consists on a cap on nuclear weapons on deployable delivery systems, as well as inspections
- **Treaty on the Non-Proliferation of Nuclear Weapons (NPT):** an international treaty whose objective is to prevent the spread of nuclear weapons and weapons technology, to promote cooperation in the peaceful uses of nuclear energy, and to further the goal of achieving nuclear disarmament and general and complete disarmament.
- **United Nations General Assembly:** the main discussion, policymaking and representative organ of the United Nations.
- **United Nations member states:** currently 193 member nations within the United Nations. This includes the Security Council and General Assembly.
- **United Nations Security Council:** charged with the maintenance of international peace and security as well as accepting new members to the United Nations and approving any changes to its United Nations Charter. It is the only body on the United Nations that has any power to construct binding resolutions to member states.
- **Uranium:** an element not only used in nuclear reactors but also a key component in nuclear weapons when enriched.
- **Warheads:** refers to the explosive and/or toxic material that is delivered by a missile, rocket, or torpedo.
- **Weapons of mass destructions (WMDs):** a nuclear, radiological, chemical, biological or other weapon that can kill and bring significant harm to a large number of humans or cause great damage to human-made structures, natural structures, or the atmosphere.