Arms Control and Proliferation Profile: North Korea

• Fact Sheets & Briefs

Last Reviewed: June 2018

North Korea is estimated to have assembled 20-30 nuclear warheads, as of June 2019, and to have the fissile material for an estimated 30-60 nuclear weapons, as well as advanced chemical and biological weapons programs. In the past several years Pyongyang has accelerated the pace of ballistic missile testing, and twice in July 2017 tested an intercontinental ballistic missile (ICBM) capable of reaching the U.S. mainland. North Korea withdrew from the nuclear Non-Proliferation Treaty (NPT) in 2003, but its withdrawal is disputed. Beginning in 2006, the UN Security Council has passed several resolutions requiring North Korea to halt its nuclear and missile activities and imposing sanctions on Pyongyang for its refusal to comply. As of early 2018, North Korea has shown interest in pursuing negotiations regarding disarmament.

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*North Korea maintains it withdrew from the NPT in 2003, but its withdrawal is
questionable.

**Comprehensive Test Ban Treaty**

**Convention on the Physical Protection of Nuclear Material (CPPNM)**

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**Nuclear Weapons Programs, Policies, and Practices**

**The Nuclear Arsenal, an Overview**

- North Korea currently is estimated to have **20-30 warheads**, as of June 2019, and the fissile material for an estimated 30-60 nuclear weapons. It may have as many as 20-100 warheads by 2020.
- North Korea is **estimated** to possess 20-40 kilograms of plutonium and 250-500 kilograms of highly enriched uranium with an annual estimated production of fissile material for 6-7 weapons, but there is a high degree of uncertainty surrounding these estimates.
- North Korea was party to the NPT, but withdrew in 2003. Not all states, however, recognize the legality of North Korea's withdrawal from the treaty.
- North Korea has conducted six nuclear tests as of September 2017. After the first test in 2006, the UN Security Council adopted resolution 1718, enacting a variety of multilateral sanctions and demanding that Pyongyang return to the NPT and halt its nuclear weapons
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History and Diplomatic Initiatives

The Origin of the Program

- North Korea, with the assistance of the Soviet Union, began constructing the Yongbyon Nuclear Research Center in the early 1960s and by the early 1970s, had access to plutonium reprocessing technology from the Soviet Union.
- In December 1985, North Korea signed the NPT as a non-nuclear weapon state.
- However, the International Atomic Energy Agency (IAEA) discovered in 1992 that North Korea had diverted plutonium from its civilian program for weapons purposes.

Joint Declaration on the Denuclearization of the Korean Peninsula

- In December 1991, the two Koreas signed a Joint Declaration on the Denuclearization of the Korean Peninsula. Under the declaration, both countries agreed not to “test, manufacture, produce, receive, possess, store, deploy or use nuclear weapons” or to “possess nuclear reprocessing and uranium enrichment facilities.” The parties also agreed to mutual inspections for verification, but they were never able to reach an agreement on implementation.
- In light of North Korea's flagrant violations, this agreement holds little weight in Seoul, which has called for an end to the prohibition on South Korean reprocessing from its bilateral nuclear agreement with the United States.
- North Korea formally declared the Joint Declaration void in January 2013.

U.S.-North Korea Agreed Framework

- In 1994, former President Jimmy Carter and North Korean leader Kim Il Sung negotiated the U.S.-North Korea Agreed Framework, in which North Korea committed to freeze its plutonium-based weapons program at Yongbyon in exchange for two light-water reactors and other forms of energy assistance. The deal eventually broke down and North Korea withdrew from the NPT.
- For more information, see The U.S.-North Korea Agreed Framework at a Glance.

Six-Party Talks

- In August 2003, in response to North Korea’s withdrawal from the NPT, Russia, China, Japan, the United States, and the two Koreas launched a multilateral diplomatic process, known as the six-party talks.
- In September 2005, the six-party talks realized its first major success with the adoption of a joint statement in which North Korea pledged to abandon its nuclear weapons activities and return to the NPT in return for security assurances and energy assistance.
- In building on the 2005 statement, North Korea took steps such as disabling its plutonium reactor at Yongbyon in 2007 and allowing IAEA inspectors into the country. In return, North Korea received fuel oil.
- North Korea declared it would no longer be bound by agreements made under the six party talks in April 2009 after a period of increased tensions.
- For more information, see: The Six Party Talks at a Glance.

Nuclear tests

- On Oct. 9, 2006, North Korea conducted its first nuclear test with an estimated yield of about one kiloton.
North Korea then conducted its second nuclear test on June 25, 2009 with the underground detonation of a nuclear device estimated to have a yield of 2 to 6 kilotons.

On February 12, 2013, the Korean Central News Agency announced that North Korea successfully detonated a nuclear device at its underground test site. The explosive yield was estimated at approximately 15 kilotons. North Korea claimed the device was ‘miniaturized’, a term commonly used to refer to a warhead light enough to fit on the tip of a ballistic missile.

On January 6, 2016, Pyongyang announced its fourth nuclear test, declaring that it was a test of the hydrogen bomb design. The explosive yield was estimated at 15-20 kilotons. Experts doubt that the test was a hydrogen bomb, but contend that the test could have used boosted fission, a process that uses lithium gas to increase the efficiency of the fission reaction for a larger explosion.

On September 9, 2016, North Korea conducted its fifth nuclear test, with an estimated explosive yield of 20-25 kilotons.

On September 3, 2017, North Korea conducted its sixth nuclear test explosion, of what experts assess could be a hydrogen bomb with an estimated explosive yield of 140-250 kilotons.

2018 Diplomatic Overture

- Kim Jong Un’s 2018 New Year’s Address
  - In his annual New Year’s Address to the nation, Kim Jong Un declared that North Korea had accomplished the “perfecting” of its nuclear program and met its strategic objectives. Kim also called for improved inter-Korean relations.

- Winter Olympics at Pyeongchang
  - After negotiations with South Korea, a delegation of North Korean athletes was allowed to participate in the 2018 Winter Olympic Games.
  - Kim Jong Un continued his so-called “charm offensive” during the Games by sending his sister, Kim Yo Jong, to deliver a letter to South Korean president Moon Jae-in inviting him to visit Pyongyang.

- Voluntary Moratorium on Testing
  - On April 20, 2018, Kim Jong-Un announced that North Korea would end all testing of nuclear weapons and long-range missiles and close the Punggye-ri nuclear test site.
  - On May 24, 2018, North Korea appeared to blow up at least three tunnels at Punggye-ri, according to international journalists who were invited to witness the demolition.

- April 2018 Inter-Korean Summit
  - On April 27, 2018, Kim Jong Un and President Moon Jae-in met in Panmunjom for a high level summit, where they discussed issues such as denuclearization and a settlement to end the Korean War.
  - A joint declaration signed by both parties included agreements to facilitate "groundbreaking advancement" in inter-Korean relations, "to make joint efforts to practically eliminate the danger of war on the Korean peninsula," and to cooperate to "establish a permanent peace regime on the Korean peninsula."

- June 2018 Trump-Kim Summit
  - On June 12, 2018, Kim Jong Un and President Trump met in Singapore for high level talks that focused on denuclearization of the Korean peninsula and improved bilateral relations.
  - The two leaders signed a joint statement agreeing to "establish new US-DPRK relations," “build a lasting and stable peace regime on the Korean peninsula” and recover POW/MIA remains. Kim also committed to "work toward complete denuclearization on the Korean peninsula" and Trump committed to provide security guarantees for North Korea.

Delivery Systems

Intercontinental Ballistic Missiles (ICBM) and Intermediate Range Ballistic Missiles (IRBM)

- North Korea is actively expanding its ballistic missile arsenal and allegedly working toward...
developing intercontinental ballistic missiles (ICBMs). As of June 2018, North Korea’s operational and developing intercontinental and intermediate-range missiles include:

- **Musudan BM-25 (Hwasong-10):** The Musudan BM-25 is an intermediate-range ballistic missile with an expected range of 2500-4000km. It has been flight tested six times, most recently on June 21, 2016.

- **Hwasong-12:** On May 14, 2017, North Korea tested another new ballistic missile, the Hwasong-12, which appears to be an intermediate-range, single-stage missile with an estimated range of 4,500 kilometers.

- **KN-08 (Hwasong-13):** The KN-08 is an intercontinental ballistic missile under development with an estimated range of 5,500-11,500km. Given that the system has not been tested, however, the range estimates are highly speculative. It was first unveiled in April 2012 and has not yet been tested, although North Korea likely tested the rocket engine for this system.

- **KN-14 (Hwasong-13, KN-08 Mod 2):** The KN-14 is an ICBM under development with an estimated range of 8,000-10,000km. Given that the system has not been tested, however, the range estimates are highly speculative. It was first unveiled in October 2015 and is believed to be a variant of the KN-08.

- **Hwasong-14:** The Hwasong-14 is an ICBM, first tested July 4, 2017 and tested again on July 28, 2017. **It is a two-stage, liquid-fueled missile.** The tests were conducted at a lofted trajectory. The first test showed a range of about 6,700km at a standard trajectory. The second test showed a range of 10,400km, not taking into account the rotation of the earth.

- **Hwasong-15:** The Hwasong-15 is an ICBM first tested November 29, 2017 at a lofted trajectory. On a standard trajectory, the missile would have an estimated range of 13,000km. It is a two-stage, liquid fueled system. Photos of the missile suggest that it has sufficient thrust and payload space to deliver a **1,000kg payload** anywhere in the United States and could be fitted with decoys or penetration aids. The missile also features qualitative updates from the Hwasong-14, including an improved steering mechanism.

- **Taepodong-2:** The inaugural flight test of the Taepodong-2, ended in failure about 40 seconds after launch on July 5, 2006. Subsequent tests of the Taepodong-2 missile in April 2009 and April 2012 were also unsuccessful. The Taepodong-2 is believed to be capable of reaching the United States if **developed as an ICBM.**

**Space-Launched Vehicles (SLV)**

- **Unha-3:** North Korea's SLV is a three-stage liquid fueled system, likely based on the Taepodong-2.
  - In February 2012, North Korea agreed to cease long-range missile tests in exchange for food aid from the United States. North Korea stated that the agreement did not cover space launch vehicles and proceeded to launch the Unha in April 2012. The SLV exploded shortly after launch. The United States contended that the agreement did cover SLVs, causing the agreement, known as the **Leap Day Deal,** to fall apart.
  - On December 12, 2012, North Korea claimed that it successfully launched a satellite into space using its Unha rocket. It placed a **second satellite into orbit** in February 2016.

**Short and Medium Range Missiles**

- North Korea's short-range and medium-range missiles include:
  - **KN-02 (Toska):** The KN-02 is an operational short-range missile with an estimated range of 120-170km.
  - **Hwasong-5:** The Hwasong-5 is an operational short-range ballistic missile with an estimated range of 300km.
  - **Hwasong-6:** The Hwasong-6 is an operational short-range ballistic missile with an estimated range of 500km.
  - **Hwasong-7:** The Hwasong-7 is an operational short-range ballistic missile with an estimated range of 700-1000km.
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- **KN-15 (Pukkuksong 2):** On February 11, 2017, North Korea launched a new medium-range ballistic missile, the Pukguksong-2, a two-stage, solid-fueled system with an estimated range of 1200-2000km.
- **No-Dong-1:** The No-Dong is an operational medium-range ballistic missile with a range of 1200-1500km.
- **KN-18:** The KN-08 is a scud variant with a maneuvering re-entry vehicle. It was first tested, successfully, on May 28, 2017. It has an estimated range of 450+ km.

**Submarines and Submarine-Launched Ballistic Missile (SLBM)**

- North Korea is developing a submarine-launched ballistic missile, the KN-11, also known as the Pukkuksong-1 or Polaris-1. It has an estimated range of 1,200km.
- The KN-11 was first tested in December 2014, and images from the missile first emerged after a May 2015 test at the Sinpo site. Photos released by the KNCA portrayed the test as a submarine launch, but the missile was likely fired from a submerged barge.
- The KN-11 was most recently tested on August 24, 2016. It is estimated to become operational by 2020.
- Since October 2014, activity at the Sinpo South Shipyard indicates that North Korea may be using an experimental SINPO-class submarine as a test bed for submarine-launched ballistic missiles.

**Fissile Material**

**Plutonium**

- Experts assess that North Korea’s 2006 and 2009 nuclear tests likely used plutonium, which North Korea was known to have produced at weapons-grade levels.
- North Korea announced its intention to restart its Yongbyon 5MWe Reactor for plutonium production in April 2013, after disabling it as a part of the six-party talks in 2007. North Korea declared the site to be “fully operational” by late August 2015.
- The reactor is capable of producing six kg of weapons-grade plutonium each year.
- Satellite imagery from April 2016, January 2017, and April 2018 confirmed increased activity at the reprocessing site.
- As of January 2018, North Korea is estimated to possess 20-40 kg of plutonium.

**Highly Enriched Uranium**

- While Pyongyang has constructed a gas centrifuge facility, it is unknown if the facility is producing uranium enriched to weapons-grade.
- In November 2010, North Korea unveiled a large uranium-enrichment plant to former officials and academics from the United States. The Yongbyon plant contained approximately 2,000 gas centrifuges that were claimed to be operating and producing low-enriched uranium (LEU) for a light-water reactor (LWR) that North Korea is constructing. This plant is estimated to be capable of producing two metric tons of LEU each year, enough to fuel the LWR reactor under construction, or to produce 40 kg of highly-enriched uranium (HEU), enough for one to two nuclear weapons.
- As of January 2018, North Korea is estimated to possess 250-500 kg of uranium.

**Proliferation Record**

**Missiles:**

- North Korea has been a key supplier of missiles and missile technology to countries in the Middle East and South Asia including Egypt, Iran, Libya, Pakistan, Syria and Yemen.
- Such transfers are believed to be one of Pyongyang’s primary sources of hard currency.
Although clientele for North Korea's missile exports appear to have dwindled in recent years due to U.S. pressure and UN sanctions, Iran and Syria remain customers of North Korean missile assistance. A February 2016 Congressional report confirmed that both Syria and Iran have received missile technology from North Korea. While Syria has also engaged in nuclear technology cooperation with North Korea, the report found no evidence that Iran has done so. 

Pyongyang is widely believed to have provided missile cooperation to Burma.

**Nuclear**

North Korea has a history of circumventing sanctions to import and export dual-use materials relevant to nuclear and ballistic missile activities and to sell conventional arms and military equipment. A UN panel of experts reports annually on adherence to UN Security Council sanctions and illicit trafficking. A few examples include:

- North Korea helped Syria to build an undeclared nuclear reactor in al-Kibar based on its own Yongbyon reactor. In 2007, the reactor, which was under construction, was destroyed by an Israeli airstrike.
- In November 2012, North Korea allegedly attempted to sell graphite rods to Syria.

**Nuclear Doctrine**

North Korea declared in January 2016 it would not be the first to use nuclear weapons unless its sovereignty is under threat and stated North Korea will “faithfully fulfill its obligation for non-proliferation and strive for the global denuclearization.” Kim Jong Un reiterated this policy in May 2016 when he said that North Korea will not use a nuclear weapon unless its sovereignty is “encroached upon by any aggressive hostile forces” with nuclear weapons. This sentiment was again repeated by Kim Jong Un during his 2018 New Year's Address.

North Korea's constitution was amended in 2013 to describe itself as a “nuclear state and an unchallengeable military power.”

Given that North Korea typically does not describe its nuclear activities accurately, it is unclear to what extent Pyongyang would abide by this declared doctrine.

**Biological Weapons**

- Pyongyang is believed to maintain a biological weapons capability.
- The United States intelligence community continues to judge that North Korea has a biotechnology infrastructure to support such a capability, and has a munitions production capacity that could be used to weaponize biological agents.
- North Korea maintains the modern Pyongyang Bio-technical Institute, purportedly a pesticide factory, equipped with dual-use equipment that can be used to maintain a biological weapons capability and, as of 2017, is likely intended to produce “military-size” batches of anthrax.

**Chemical Weapons**

- North Korea is widely reported to possess a large arsenal of chemical weapons, including mustard, phosgene, and sarin agents.
- According to U.S. military estimates, North Korea “can deploy missiles with chemical warheads.”
- North Korea is believed to have 2,500 to 5,000 tons of chemical weapons according to the South Korean Ministry of National Defense.
- In February 2017, North Korean agents used VX, widely believed to be the most toxic known nerve agent, to assassinate Kim Jong Nam, the half-brother of Kim Jong Un in Malaysia.

**Additional Resources on North Korea**
1. Factsheet: Chronology of U.S.-North Korean Nuclear and Missle Diplomacy
2. Factsheet: UN Security Council Resolutions on North Korea
3. Factsheet: The Six-Party Talks at a Glance
5. Issue Brief, February 2017: Recalibrating U.S. Policy Toward North Korea

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