

Open Nuclear Network's

NUCLEAR RISK REDUCTION APPROACH FOR THE KOREAN PENINSULA

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OPEN NUCLEAR
NETWORK

a programme of One Earth Future

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ABSTRACT

Open Nuclear Network (ONN), a programme of One Earth Future, is a non-governmental organisation committed to global peacebuilding efforts via the two-pronged approach explained in this paper. ONN is dedicated to reducing nuclear risks through the use of open source data analysis and engagement with decision makers in areas of conflict. Its focus this year — the 70th anniversary of the beginning of the Korean War — is on the Korean Peninsula and the continued tension in the region. This paper examines the complex entanglement surrounding the Korean Peninsula's nuclear crisis and identifies possible triggers and pathways towards conflict escalation. It serves both as a guide to establishing a general operational concept and as an action plan outline for ONN's analysts and its Engagement Network to reduce the risk that nuclear weapons may be used in response to error, uncertainty and misdirection during times of crisis.

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I. INTRODUCTION

Open Nuclear Network (ONN) is an independent non-governmental organisation with a mission to reduce the risk of nuclear weapons being used due to error, uncertainty or misdirection, particularly in the context of escalating conflict. To achieve its goal, ONN has created a two-pronged approach using open source data analysis and the engagement of decision makers.

With the help of the Datayo software platform, which was designed specifically to facilitate ONN's open source data monitoring and analysis, ONN's diverse team of analysts produces operational insights. These resources are intended to be transparent, well-sourced and entirely shareable due to their open source nature.

These analyses are shared with top decision makers through a network of trusted intermediaries known as the Engagement Network. Members of the network are primarily former government officials (civilian and military), prominent academics and other well-regarded relevant experts. Members of the Engagement Network provide guidance and expertise to the ONN analytical team and, in turn, share ONN's briefings with decision makers, convening meetings and other activities with a view to de-escalating conflict.

While ONN has identified five major contexts of conflict which could lead to nuclear use, its primary focus at this time is the Korean Peninsula. Should ONN demonstrate positive impact in this context, it will gradually scale up its work to other conflict contexts: China/United States; NATO/Russia; India/Pakistan; and Iran/Israel/United States.

Since the armistice of the Korean War, a number of attempts have been made to fundamentally alter the security environment in Northeast Asia. Over the years, the nuclear programme of the Democratic People's Republic of Korea (DPRK) has become more sophisticated, while the qualitative superiority in the conventional realm of the Republic of Korea (ROK) and the United States of America (United States) has also grown. A major armed conflict has been kept at bay thus far. However, with a new nuclear player on the Korean Peninsula, the risks of inadvertent nuclear use have increased.

For its inaugural report to the Engagement Network, ONN's analytical team will lay out its current understanding of possible pathways for conflict escalation on the Korean Peninsula and present its two-pronged approach. In the future, ONN analysts will provide a variety of briefing material to support the ongoing nuclear risk reduction work of the Engagement Network.



Photo of demilitarized zone (DMZ) that separates the Korean Peninsula.
Credit: Blue House

II. SIX COUNTRY PROFILES

Conflict on the Korean Peninsula is not new, and many seemingly superficial decisions are rooted in perceptions of history and geopolitical ambitions. Regardless of whether it is conventional or nuclear, conflict will likely include six major stakeholders — namely, China, the DPRK, Japan, the ROK, Russia and the United States. All these countries' decisions are crucial to the escalation or de-escalation of conflict in the region.

A. China

China is the only nuclear-weapon State that maintains a declared policy of unconditional no-first-use.¹ In order to make this declaration credible, China has sought to separate its ballistic missiles and warheads. However, because these missiles are capable of carrying both conventional and nuclear warheads, it would be challenging for the United States to distinguish between conventional- and nuclear-armed missiles during a crisis. Further adding to this challenge is China's expanding nuclear submarine-launched ballistic missile (SLBM) capability. While not confirmed by Chinese officials, there is growing concern that SLBMs may be armed with live warheads and are in launch-ready status during patrol.²

Open source researchers estimate that China possesses approximately 320 nuclear warheads, making it the third largest holder of nuclear weapons after Russia and the United States.³ While Ambassador Fu Cong, Director General of the Department of Arms Control at the Chinese Foreign Ministry, cited estimates of Chinese nuclear warheads by foreign think tanks in a press briefing on 8 July 2020,⁴ this should not be interpreted as confirmation of these estimates by China.

The People's Liberation Army Rocket Force (PLARF) is deploying modern weapon systems such as the DF-41 and DF-31AG intercontinental ballistic missiles (ICBMs). The PLA Navy is operating a strategic fleet consisting of a growing number⁵ of type 094 submarines armed with JL-2 intercontinental range SLBMs. According to the US Department of Defense, China is estimated to have deployed 125 nuclear-armed missiles,

some capable of carrying multiple warheads, that can threaten the United States.⁶ Beijing has made it explicitly clear that some of its shorter-range missiles can be armed with both conventional and nuclear warheads, referring to them officially as *nuclear and conventional dual-use missiles*.⁷

In principle, China prioritizes preventing a collapse of the DPRK or a military conflict on the peninsula because a failed DPRK or the complete deterioration of the DPRK economy would result in a massive inflow of refugees to China, thus compromising China's border security.⁸ China's interest in keeping the *status quo* on the peninsula is evidenced by Beijing's long-term position towards the peninsula of "no war, no instability and no nukes".⁹ According to some Chinese State-run media reports, this term appears to have been modified in 2018 to "denuclearization of the peninsula, no war and no instability".¹⁰ China has never publicly stated how it would react to the DPRK's use of nuclear weapons, or under what conditions China might tolerate this, possibly because such a statement could also be seen as recognition of the DPRK as a *de facto* nuclear-weapon State.

A scenario of possible DPRK nuclear use against China has rarely been discussed in Chinese literature. The only publicly available Chinese opinions on possible nuclear use against China have come from Zhang Lianggui and Shen Zhihua. Zhang, a professor of Korean studies at the Central Party School of the Communist Party of China Central Committee, wrote in his article that nuclear weapons gave the DPRK the ability to directly threaten China's heartland and expressed a deep distrust in Pyongyang's stated intention to pursue nuclear weapons.¹¹ In a separate public forum, Zhang warned against the "subjective assumption that the DPRK nuclear weapon is only meant for the United States, not China."¹² Shen, a leading Chinese expert on DPRK and Cold War history, has stated that China's recognition of the ROK is seen by Pyongyang as

Spelling: *defense* vs. *defence*. Both spellings can be found in this paper since ONN applies international spelling conventions (reference: Oxford Concise Dictionary) except where official terminology differs.

a betrayal, which accelerated the DPRK's nuclear programme. He implied further that the DPRK's nuclear weapons were actually intended to deal with China.¹³ These opinions are not mainstream in China. It is difficult to assess whether these concerns are shared by top Party officials or other academics.

China maintains a strong military presence in its northeast territory. However, it has never publicly revealed information about its military contingency plan for conflict in the DPRK. Some military drills in that region have been interpreted in the context of the DPRK nuclear crisis by some foreign media. However, the Chinese Government has repeatedly dismissed such reports of PLA troop movements in areas bordering the DPRK.

The US Department of Defense has estimated that the PLA's Northern Theatre, which would respond in the event of a conflict with the DPRK, comprises approximately 170,000 soldiers; additional theatres could also be asked to support a larger DPRK-related contingency.

Since at least 2004, the PLA has sought to strengthen its ability to conduct joint operations near the Korean Peninsula, placing particular emphasis on border defence. Other elements of the PLA have focused on defending the Yellow Sea from intervention by the United States and South Korea.¹⁴



DPRK leader Kim Jong Un meets with Chinese leader Xi Jinping in Dalian, China, May 2018. Credit: KCNA

The *Sino-North Korean Mutual Aid and Cooperation Friendship Treaty* signed in 1961 stipulates that China is obliged to take all measures to support the DPRK if the latter is under aggression.¹⁵ The treaty will be renewed for another 20 years in 2021 if neither party raises objections. However, arguments have emerged in China that the treaty leaves room for interpretation by China to refrain from military intervention on behalf of the DPRK. For example, in 2017, an English-language news publication run by the Chinese Communist Party carried an editorial article that included the following:

China should also make clear that if North Korea launches missiles that threaten US soil first and the US retaliates, China will stay neutral. If the US and South Korea carry out strikes and try to overthrow the North Korean regime and change the political pattern of the Korean Peninsula, China will prevent them from doing so.¹⁶

However, in April 2016, President Xi Jinping, the General Secretary of the Communist Party of China, said that he would “absolutely not permit war or chaos on the peninsula.”¹⁷ It is reasonable to conclude that Beijing would call upon all parties to practice restraint and try to mediate at the early stages of a conflict. However, should the conflict spiral into war, Beijing could take action or use preemptive means to protect its core interests of “no war and no chaos” regardless of who started the conflict.

China opposes control of the Korean Peninsula by the ROK or the United States. To address such concerns, then-US Secretary of State Rex Tillerson in late 2017 assured China that the United States had no plans to occupy the DPRK and would retreat to south of the 38th parallel after the DPRK's nuclear weapons had been neutralized.¹⁸ However, long-term strategic rivalry between China and the United States over influence on the peninsula remains a key conflict risk factor. Moreover, historically, Beijing sees the outbreak of the Korean War as one of the major reasons it lost the opportunity to unify with the province of Taiwan by force.¹⁹ This view might also influence Chinese decision making in the event of a resumption of the Korean War.

Apart from war planning, China may have been preparing for an influx of DPRK migrants.

According to a leaked document allegedly issued by telecommunications company China Mobile in December 2017, China was planning to establish five DPRK refugee camps in its Changbai County, which borders the DPRK, in response to heightened tension on the peninsula.²⁰ Separately, the Japanese news outlet Kyodo²¹ claimed to have obtained a Chinese military document that identified proposed actions in response to a DPRK contingency, such as setting up refugee camps and detaining and controlling DPRK top leadership. The authenticity of the document cannot be independently verified.

China has become a world power and that has deeply affected its relationship with its neighbours and with the United States. It has worked effectively in the Six Party Talks. Nevertheless, recent disputes between China and the United States have adversely impacted coordinated engagement with the DPRK.

B. DPRK

Between 2006 and 2016, the DPRK detonated a total of five nuclear devices. In September 2017, a sixth nuclear weapon test was conducted, likely a thermonuclear weapon test, though the possibility of it having been a test of a boosted fission device cannot yet be ruled out on the basis of the limited data available. Yield estimates for the sixth test vary widely, but it was an order of magnitude larger than the fission weapons previously tested.ⁱ

The number of warheads that the DPRK could have produced by now is equally difficult to assess because it depends not only on the total amount of fissile material produced but also on the efficiency of the warhead's use of the material.ⁱⁱ Some open source research has been conducted on the amount of fissile material the DPRK could produce on the basis of activities at their mining, milling, plutonium production and known uranium enrichment sites; however, there is no conclusive agreement. The US Defense Intelligence Agency reportedly produced a document that was leaked to *The Washington Post* stating, "The IC [intelligence community] assesses North Korea has produced nuclear weapons for ballistic missile delivery, to include delivery by ICBM-class missiles." The document allegedly assessed that, as of July 2017, "60 nuclear weapons are now controlled by North Korean leader Kim Jong Un."²²

Over the years, the DPRK has developed and deployed a wide range of ballistic missiles that could threaten the US homeland and strike targets in US territories, including Guam, as well as targets in the ROK and in Japan. Especially since 2016, DPRK ballistic missile tests appear to be aiming at achieving multiple objectives, including: (1) extending the firing range; (2) enhancing the accuracy and operation capabilities for saturation attacks; (3) improving the ability for surprise attacks; (4) diversifying the launch forms by including lofted trajectories; and (5) defeating missile defence systems by using irregular trajectories.²³

ESTIMATING DPRK'S NUCLEAR CAPACITY

- i The calculation of yield of an underground nuclear explosion was developed using early US and Soviet tests in Nevada and Novaya Zemlya, respectively. The topography and geology of the Punggye-ri nuclear test site is dramatically different, leading to wide divergence and low confidence in estimating the yields of North Korea's nuclear weapons. Estimates of the yield of the DPRK's first five nuclear tests are below or close to the yield of the Nagasaki bomb, while estimates of the yield of the sixth test are much higher. See, for example, 中科大：朝鲜此次核爆威力是长崎原子弹3至7.8倍 [the University of Science and Technology of China: DPRK's six nuclear test yield is 3 to 7.8 times of the Nagasaki bomb], 4 September 2017, available at: http://www.ce.cn/xwzx/gnsz/gdxw/201709/04/t20170904_25713510.shtml
- ii Estimates of the number of DPRK nuclear weapons are generally based on monitoring known fissile material production facilities at Yongbyon such as the 5MW reactor, which produces plutonium, and the uranium enrichment facility. Yongbyon is also thought to have a tritium production facility but this has not been visited by outside experts. However, the DPRK likely has other sites where undeclared uranium enrichment is carried out, such as the alleged site believed to be near Kangson. Ankit Panda, *Exclusive: Revealing Kangson, North Korea's First Covert Uranium Enrichment Site*, *The Diplomat*, 13 July 2018, available at: <https://thediplomat.com/2018/07/exclusive-revealing-kangson-north-koreas-first-covert-uranium-enrichment-site/>

The DPRK's arsenal of nuclear-capable short- to mid-range ballistic missiles poses a strong and growing capability against countries and US troops in the region. Since 2016, the DPRK has demonstrated new capabilities such as solid fuel and maneuverable missiles, which — if mated with nuclear warheads in the future — would make the region more unstable by shortening response times, forcing neighbours to distinguish between a conventional or nuclear warhead, and increasing a sense of vulnerability to the DPRK's offensive weapons that challenge the ability of defensive systems to intercept them.

The DPRK has likely had the capability to deliver a nuclear weapon to the United States mainland as early as 2017, as assessed on the basis of measurements of its July and November ICBM tests, measurements of its purported fission warhead and comparisons with other systems. However, it was not until 2019 that the US Department of Defense assessed that the DPRK already had “the capability to threaten the United States homeland with a nuclear-armed missile attack.”²⁴ As of July 2020, the DPRK has not conducted a full-range flight test of an ICBM. This, in itself, creates a dangerous paradox whereby in order to become credible in the eyes of skeptics, the DPRK may feel the need to demonstrate its capability in a way that could potentially be interpreted as the beginning of a nuclear war rather than a test.

While the DPRK has not publicly declared a nuclear doctrine, public statements and testing activities may provide some insight on how it wants its intentions to be perceived. In its *Law on Consolidating Position of Nuclear-Weapon State*, the DPRK, during the Seventh Session of the 12th Supreme People's Assembly on 1 April 2013, added a statement to the effect that “nuclear weapons of the DPRK can be used only by a final order of the Supreme Commander of the Korean's People Army (KPA) to repel invasion or attack from a hostile nuclear-weapon State and make retaliatory strikes.”²⁵ It is important to note here that the law makes no explicit distinction between a conventional or nuclear attack by a hostile nuclear-weapon State. The law also declares that the “DPRK shall neither use nukes against the non-nuclear States nor threaten them with those weapons unless they join a hostile nuclear-weapon State in its invasion and attack on the DPRK”, implying Japan or the ROK, which have alliances with the United States.

In addition to laws and public statements, the DPRK has engaged in a number of nuclear-capable missile testing scenarios that shed light on how it may choose to use nuclear weapons in the future. The DPRK operates a large number of flight-tested Soviet Scud missile variants capable of delivering a nuclear warhead. They are currently the primary means for the KPA to deliver nuclear warheads to the Northeast Asia

NUCLEAR WEAPONS AS DPRK DETERRENT AGAINST INVASION

The role of nuclear weapons as a deterrent for invasion is emphasised frequently. For example, Chairman Kim Jong Un states in a speech on 2 April 2013 that “nuclear power is a reliable war deterrent and provides security for the protection for the independence of the people [우리의 핵무력은 믿음직한 전쟁억제력으로, 민족의 자주권을 수호하기 위한 담보로 됩니다]”, adding that since the emergence of nuclear weapons, only nuclear weapon-armed States have been free of invasion. In that context, preemptive strikes are also mentioned as a real option. One notable example is in a letter dated 24 February 2016 from the Supreme Command of the KPA addressed to the UN Secretary-General, which specifically mentions the ROK-US Operation Plan (OPLAN) 5015: “From this moment all the powerful strategic and tactical strike means of our revolutionary armed forces will go into preemptive and just operation to beat back the enemy forces to the last man if there is a slight sign of their special operation forces and equipment moving to carry out a “beheading operation” or “high-density strike.” It states that a “primary target” would be the ROK's Presidential Blue House and US bases in the Asia-Pacific region and the US mainland for second strikes.

조선로동당 중앙위 3월전원회의 보고-로동신문 [Report on the March Plenary Session of the Workers' Party of Korea's Central Committee-Rodong Sinmun], KCNA, 2 April 2013; Ja Song Nam, Letter dated 24 February 2016 from the Permanent Representative of the Democratic People's Republic of Korea to the United Nations addressed to the Secretary-General, 24 February 2016, available at: <https://undocs.org/pdf?symbol=en/A/70/760>



Kim Jong Un's map shows ballistic missile drill, 19 July 2016, likely as practice for a strike plan against Busan. Credit: KCNA

region, including all of the territory of the ROK and Japan, and to the Chinese eastern territories, including Beijing and Shanghai.

A series of tests carried out by the DPRK between 2016 and 2018 of its Hwasong-7 and Scud-ER missiles, the most advanced short- to mid-range ballistic missiles currently operated by the Korean People's Army, shifted from testing the reliability of new technology and instead seemed to focus on how missiles would be used. In some cases, the State media carried photos that included maps indicating the range ring of missile tests. For example, referring to the photo above, DPRK State media claimed the test was conducted "in simulation of preemptive strikes against sea and

air ports in the South Korean operational zone to which US nuclear war equipment is committed."

The aggregate of these tests, as shown in Figure 1 on the next page, indicates that the DPRK may seek to undertake saturation strikes against military bases in the ROK and Japan,²⁶ such as Iwakuni Air Base and Busan Naval Base, respectively. Because conventional warheads would be insufficient to quickly neutralize these bases, "North Korea is developing an offensive doctrine for the large-scale use of nuclear weapons in the early stages of a conflict," argues US academic Dr. Jeffrey Lewis.²⁷

The DPRK operates a large number of flight-tested missiles capable of delivering a nuclear warhead. This includes the Hwasong-5 short-range ballistic missile, the Hwasong-6 short-range ballistic missile, an extended range version of the Hwasong-6 and the Hwasong-7 medium-range ballistic missile, referred to by the US Government as Scud-B, Scud-C, Scud ER and Rodong, respectively. Credit: ONN



FIGURE 1: REPORTED Hwasong-7 AND Scud ER LAUNCHES SINCE KIM JONG UN TOOK POWER

Date	Number and types	Reported/estimated range	Remarks
26 Mar. 2014	2 Hwasong-7 missiles	650 km ²⁸	First reported Hwasong-7 launch since 2009.
18 Mar. 2016	2 Hwasong-7 missiles	800 km ²⁹	First mid-range missile launched since 26 March 2014. One failed. ³⁰
19 July 2016	2 Hwasong-7 missiles (and 1 Hwasong-5 or 6 missile)	500 to 600 km ³¹ or 400 to 500 km ³²	The test was likely carried out to demonstrate capability to reach Busan Naval Base.
3 Aug. 2016	2 Hwasong-7 missiles	1000 km ³³	One of the missiles reportedly exploded in flight.
5 Sep. 2016	3 Scud ER missiles	1000 km ³⁴	This approximate range is sufficient to reach the G20 venue where world leaders had gathered.
6 Mar. 2017	4 or 5 Scud ER missiles	1000 km ³⁵	DPRK stated that this test demonstrated its capability to reach "US imperialist aggressor forces in Japan." ³⁶

Launch events in light blue were reported by DPRK State media

Recently, the DPRK has been making extensive efforts to develop several types of advanced nuclear-capable short-range ballistic missiles which could only target the ROK. Therefore, the DPRK may be also considering a limited use of nuclear weapons against the ROK for coercive purposes, or an early use of nuclear weapons against the US Forces Korea, the ROK and, possibly, Japan.

C. Japan

Japan's history and geography are closely intertwined with that of the Korean Peninsula and mainland China. The historical grievances held by the DPRK, China and the ROK have had non-negligible impacts on Japan's diplomatic relations with these countries, in addition to the continuation of territorial disputes. In the twenty-first century, Japan's concerns about peninsula affairs have centred around three key agendas: (1) the increasing Chinese influence over the peninsula; (2) the increasing weapon of mass destruction capabilities of the DPRK; and (3) its own vacillating relationship with the ROK. In order to address these security concerns, Japan considers its security cooperation with the United States and US military presence in East Asia,

including the sustainment of the US Forces Korea (USFK) and US Forces Japan (USFJ), as essential. In Japan's official view, the US alliance system has played a crucial role in shaping the security environment in the Asia-Pacific region, including the Korean Peninsula.³⁷

Japan's policy towards the DPRK is founded on the *Japan-DPRK Pyongyang Declaration* which was signed by the two countries' leaders on 17 September 2002. In the declaration, Japan and the DPRK pledged that they would "sincerely tackle outstanding problems" between the two countries and that they would "cooperate with each other in order to maintain and strengthen the peace and stability of Northeast Asia."³⁸ With regard to its current approach towards the Korean Peninsula, Japan's National Security Strategy of 17 December 2013, adopted by the Shinzo Abe administration, articulates the following two key policies:³⁹ (1) pursuing a comprehensive resolution with the DPRK of "outstanding issues of concern" between the two countries, including the abduction by the DPRK of Japanese citizens and the DPRK's nuclear and ballistic missile development; and (2) strengthening the Japan-US alliance in tandem with Japan-ROK-US trilateral security cooperation.

The foremost outstanding issue of concern is the lives and security of the Japanese citizens abducted by the DPRK, which is deemed by Japan as a serious infringement of its sovereignty. In Japan's view, any agreement with the DPRK must address this.⁴⁰ In the past, Japan's consistent pursuit of a "comprehensive resolution" with the DPRK was seen by some US negotiators as complicating US negotiations with the DPRK over the latter's nuclear and ballistic missile issues.⁴¹ Nevertheless, Japan's position remains consistent and is supported by the Trump administration.⁴²

In order to advance the DPRK's denuclearization, Japan pursued, in coordination with the United States, a "pressure and dialogue" policy vis-à-vis the DPRK and joined the United States' maximum pressure campaign in 2017, also consistently pursuing "complete, verifiable and irreversible denuclearization" of the DPRK. Since 2018, Japanese Prime Minister Abe has changed his approach towards the DPRK by openly stating that he was ready to meet with Chairman Kim Jong Un without any conditions; however, the DPRK has not accepted his offer.

As for the DPRK's nuclear and ballistic missile programmes, Japan is particularly concerned about the hundreds of nuclear-capable medium-range ballistic missiles which could cover Japan's entire territory in combat deployment.⁴³ In its 2019 Defense White Paper, the Japanese Ministry of Defense assessed that "North Korea has already miniaturized nuclear weapons to fit ballistic missile warheads."⁴⁴ Japan was especially alarmed by a series of launches by the DPRK in May, July and August 2019 that demonstrated the DPRK's capabilities to undertake a saturation surprise nuclear attack against Japan.



2002 Japan-DPRK Pyongyang Declaration. Credit: Ministry of Foreign Affairs, Japan

Furthermore, the DPRK's nuclear and ballistic missile programmes contain regional security implications. Since the 1990s, the DPRK's provocations have led Japan to strengthen its military posture and the Japan-US alliance, as demonstrated by Japan's extending cooperation with the US missile defence systems, renewals in 1997 and 2015 of the *Guidelines for Japan-US Defense Cooperation* and Japan's adoption in 2014 of *Legislation for Peace and Security*. Those developments have enabled Japan and the United States to engage in broader bilateral security cooperation and Japan to play an increased role in regional and international conflicts and contingencies.

In the event of conventional or nuclear war on the Korean Peninsula, Japan would be responsible for providing rear area support for USFJ, pursuant to the Japan-US security cooperation arrangements.⁴⁵ Access to military bases in Japan would be essential for the US Navy and Air Force to receive supplies, including fuel and ammunition.⁴⁶ A blockade by China would be a key concern in keeping forces supplied.

By activating its missile defence systems, Japan would also be responsible for protecting the US forces and military bases from the DPRK's ballistic missile attacks. Should the DPRK threaten Japan with such attacks and successfully coerce Japan to refrain from providing rear area support to the USFJ, the combat capability of the US forces on the Korean Peninsula could be significantly constrained.

To prepare for conflict on the Korean Peninsula, Japan-US military planning would likely proceed in tandem with ROK-US military planning. In Japan's view, trilateral security cooperation forms a key part of the conflict escalation ladder on the peninsula, and a lack of close trilateral security coordination could result in accidents or unexpected problems during an emergency. Japan-ROK relations have deteriorated considerably since 2019 due to bilateral confrontations over various issues, including historical conflicts and trade-related disputes, which could further affect the ability of the United States to control conflict escalation during a crisis.

As of June 2020, discussion has recommenced within the Japanese Government and Parliament about options for a national capability to strike

ballistic missile sites in the DPRK to complement the existing missile defence system. Some leading Japanese members of Parliament have also opened discussion on allowing US nuclear weapons to return to Japan.⁴⁷

D. ROK

The ROK does not possess nuclear weapons and no longer hosts US nuclear weapons. However, its conventional military forces are well trained and equipped. Moreover, it continues to invest in ballistic and cruise missile capabilities aimed at the DPRK. Its existing Hyunmoo missiles are able to deliver a one-ton conventional warhead anywhere within the territory of the DPRK.⁴⁸ In addition, the Ministry of National Defense has indicated that it has succeeded in developing a new ballistic missile with the “world’s heaviest warhead,” which is reported to be the new deep-penetration Hyunmoo-4 with a two-ton capacity and 800 km range.⁴⁹ With accurate intelligence, such a weapon could be used in a decapitation strike against DPRK leadership even in a fortified bunker.

Throughout President Moon Jae-in’s term, including successive inter-Korean summits and preparatory meetings for engagement initiatives, the ROK has attempted to pursue an approach that jointly addresses the issue of bilateral relations and the nuclear threat, including related complications ranging from sanctions compliance to alliance management. The Moon Jae-in Administration’s policy towards the DPRK is organised around three core goals: “(1) resolution of the nuclear issue and establishment of a permanent peace regime, (2) development of sustainable inter-Korean relations and (3) realization of a new economic community.”⁵⁰ One of the clearest articulations of this position was provided early on, during President Moon’s Berlin Initiative speech in 2017⁵¹ in which he highlighted that — while the administration would make continual engagement efforts — much of the responsibility for success lay with the DPRK: “Whether it will come out to the forum for dialogue, or whether it will kick away this opportunity for dialogue that has been made with difficulty, is only a decision that North Korea can make. But if North Korea does not stop its nuclear provocations, there will be no other choice but to further strengthen sanctions and pressure. Peace on the Korean Peninsula and North Korea’s security will not be guaranteed.”⁵²



ROK’s Hyunmoo-II ballistic missile fired during exercise at undisclosed location in ROK. Credit: Ministry of National Defense, ROK/NurPhoto via Getty Images.

To make this *forum for dialogue* more acceptable to the DPRK, the administration has since continually emphasised its “three NOs”: no desire for the DPRK’s collapse, no pursuit of unification by absorption and no pursuit of unification through artificial means.⁵³

In the military realm, the DPRK and the ROK succeeded in signing a *Comprehensive Military Agreement* in 2017 as part of the *Panmunjom Declaration* between the DPRK and the ROK identifying a number of confidence-building measures aimed at reducing the forward positioning of both sides’ military in the border region and to “completely cease all hostile acts against each other.”⁵⁴ The ROK’s defensive posture, however, remains largely unchanged at core in its asymmetric approach to address the threat from its northern neighbour.

The significant increase in military spending and modernization planning since 2017 is also noteworthy. Defence spending has been on a constant rise with a budget of 40.3 trillion KRW



Kim Jong Un and Moon Jae-in cross the line at Panmunjom, DMZ, 27 April 2018. Credit: Blue House

in 2017 (~31.7 billion EUR) to 50.15 trillion KRW (~39.5 billion EUR) in 2020,⁵⁵ with plans to spend an additional 300.7 trillion KRW (~214.1 billion EUR) in 2021–2025.⁵⁶ Although part of this significant increase over the past few years is to offset a growing military personnel deficit due to an ageing population, it is also part of more extensive defence modernization planning. This would allow for operational control transfer from the United States to the ROK and for a more independent and leaner military capable of adequately addressing threats from the DPRK.⁵⁷

The ROK's Ministry of National Defense's most recent White Paper describes the basic objective of its military strategy as "to deter provocations and invasions from external forces and, if deterrence fails, achieve an early victory with the least damage possible, within the shortest time possible."⁵⁸ While the ROK's deterrence and response planning is tightly integrated with that of the United States, as reflected in the *Tailored Deterrence Strategy* and *4D Operational Concept*,⁵⁹ it has simultaneously accelerated efforts to develop its own capabilities to counter nuclear and missile threats. The framework for this is the *triad* or *three-axis defence system*, which was first articulated in 2016 with plans for full deployment in the mid-2020s.⁶⁰ The triad consists of a *kill chain preemptive strike system*, the *Korea Air and Missile Defense (KAMD)* and the *Korea Massive Punishment and Retaliation (KMPR)*, for strikes against nuclear and missile operations systems, terminal phase missile interception capabilities and retaliatory strikes against key leadership sites, respectively.

Though the Ministry of National Defense announced in early 2019 that the *three-axis defence system* terminology had been changed,⁶¹ recent exercises, advanced reconnaissance vehicle deployments and development announcements, and also plans for significant investment in its own missile defence and "strategic target strike" missile programme, suggest that there have been no substantive operational changes to the conceptual framework.⁶² This is also reflected in the most recent *2021–2025 Mid-Term Defense Plan*, which additionally announced the planned acquisition of a light aircraft carrier, production of its indigenous KF-X fighter jet series, building new 3,600 and 4,000 ton possibly nuclear-powered and SLBM equipped submarines and deployment of a Korean version of Israel's Iron Dome air defense system.⁶³ It can be expected that the ROK will continue to pursue military modernization focusing on its own denial and punishment capabilities, independent of successes or failures in its engagement policy towards the DPRK.

E. Russia

Though the Soviet Union was not an official participant in the Korean War, it occupied the northern half of the Korean Peninsula at the end of World War II and has, therefore, profoundly affected the politics and culture of the DPRK. While Russia does not play a very vocal role in conflict management on the peninsula, its hands-off approach has garnered the DPRK's trust.

The Soviet Union was the first country to recognize the DPRK as a State and subsequently establish diplomatic relations with it on 12 October 1948.⁶⁴ The two countries maintained regular high-level close contact and, in 1961, signed a *Treaty of Friendship, Cooperation and Mutual Assistance (Friendship Treaty)*. According to the treaty, among other provisions, the countries agreed to be military allies. Each committed to providing military assistance “by all means at its disposal” if “one of the Contracting Parties is subjected to an armed attack by a State or a coalition of States and thus finds itself in a state of war” (Article 1).⁶⁵ Russia and the DPRK concluded a new treaty in 2000.⁶⁶ Significantly weakening the language on military assistance, the new iteration provides only for mutual consultation “in the event of a danger of aggression against one of the Parties or a situation threatening peace and security” (Article 2). In addition to the *Friendship Treaty*, the legal bases for DPRK-Russia relations are laid out in the *Pyongyang (2000)*⁶⁷ and *Moscow (2001)*⁶⁸ *Declarations* signed during President Putin’s visit to the DPRK and Chairman Kim Jong Il’s visit to Russia, respectively.

Russia has the world’s largest stockpile of nuclear warheads and their means of delivery as well as a significant arsenal of conventional weaponry. In implementing arms control agreements and abiding by other threat reduction measures, Russia has significantly downsized its weapon arsenals since their peak in the Cold War. While reducing the number of weapons in its arsenals, Russia has been conducting major modernization programmes to improve its strategic nuclear weapons and their delivery systems. According to the latest estimates,

Russia currently possesses approximately 6,400 nuclear warheads⁶⁹ (1,572 deployed, 2,740 non-deployed and 4,312 in stockpile).⁷⁰

Russia’s military doctrine explicitly states that “prevention of a nuclear military conflict, like any other military conflict, is the foundation of military policy of the Russian Federation” (Article 20).⁷¹ According to the same document, Russia reserves the right to use nuclear weapons in response to a nuclear or other weapon of mass destruction attack against Russia or its allies or in the case of conventional attack against Russia when the very existence of the State is in jeopardy (Article 27).⁷² On 2 June 2020, for the first time in its history, Russia published its *Basic Principles of State Policy on Nuclear Deterrence*. While reiterating the provision on nuclear weapon use from the military doctrine, the document specifies the conditions under which Russia could possibly use nuclear weapons (paragraph 19), namely:⁷³

- arrival of reliable data on a launch of ballistic missiles attacking the territory of the Russian Federation or its allies;
- use of nuclear weapons or other types of weapons of mass destruction by an adversary against the Russian Federation or its allies;
- attack by an adversary against critical governmental or military sites of the Russian Federation, disruption of which would undermine its nuclear forces’ response actions; and

TREATY OF FRIENDSHIP, COOPERATION AND MUTUAL ASSISTANCE BETWEEN RUSSIAN FEDERATION AND DEMOCRATIC PEOPLE’S REPUBLIC OF KOREA

The 1961 agreement also embodied a legal expression of the unity of views of the parties that the unification of the Korean Peninsula should be carried out on a peaceful basis which is in the national interest of Korean people. The 2000 agreement further specified mutual understanding of the need for “speedy elimination of the split of Korea, which is a constant factor of international tensions” and reconfirmed that “peaceful reunification and national consolidation are fully in the national interests of the Korean people and will serve as a contribution to peace and security in Asia and around the world.”

Договор о дружбе, добрососедстве и сотрудничестве между Российской Федерацией и Корейской Народно-демократической Республикой [Treaty of friendship, cooperation and mutual assistance between Russian Federation and Democratic People’s Republic of Korea], signed at Pyongyang, on 9 February 2000, available at: <http://docs.cntd.ru/document/901771436>



Left: Kim Jong Il and Vladimir Putin at signing ceremony of the Moscow Declaration, August 2001. Right: Kim Jong Un and Putin, Russkiy Island, Vladivostok, April 2019. Credit: Kremlin

- aggression against the Russian Federation with the use of conventional weapons when the very existence of the State is in jeopardy.

The *Basic Principles of State Policy on Nuclear Deterrence* also outline concrete military threats for which Russia plans to neutralize an adversary by implementation of nuclear deterrence (paragraph 12), namely:⁷⁴

- buildup by a potential adversary of the groupings of general purpose forces that possess nuclear weapon delivery means in the territories of States contiguous with the Russian Federation and its allies, and in adjacent waters;
- deployment by States which consider the Russian Federation as a potential adversary of missile defence systems and means, medium- and shorter-range cruise and ballistic missiles, non-nuclear high-precision and hypersonic weapons, unmanned aerial strike vehicles and directed energy weapons;
- development and deployment of missile defence assets and strike systems in outer space;
- possession by States of nuclear weapons or other types of weapons of mass destruction — and of their means of delivery — that can be used against the Russian Federation or its allies;
- uncontrolled proliferation of nuclear weapons, their delivery means, technology and equipment for their manufacture; and

- deployment of nuclear weapons and their delivery means in the territories of non-nuclear-weapon States.

Arguably, except for the penultimate point, which could be applicable to States such as Iran and the DPRK, all other points are designed to reflect characteristics of modern US and NATO policies. The first point explicitly mentions that deployment by a “potential adversary” of nuclear-capable delivery systems next to its territories would be perceived as a military threat. This illustrates Russia’s concern about the possibility of US nuclear weapons, intermediate-range missiles and missile defence systems being deployed on the territories of the ROK or Japan.⁷⁵

Russia has continuously called for tension de-escalation and advocated for denuclearization of the Korean Peninsula.⁷⁶ It believes that Pyongyang’s nuclear and missile programmes are “an additional factor in eroding the nuclear non-proliferation regime based on the *Treaty on the Non-Proliferation of Nuclear Weapons (NPT)*, increasing regional tension and complicating the solution of the problems of the Korean Peninsula.”⁷⁷

At the same time, Russia has publicly counterbalanced the United States’ efforts to force unilateral DPRK denuclearization, particularly through the promulgation and enforcement of sanctions. In 2018, Foreign Minister Sergei Lavrov called on the DPRK and US officials during his visit to Pyongyang “to feel the level of responsibility” in the then-upcoming high-level meeting between the two countries. He also recommended that the United States not demand denuclearization “all at once”, highlighting that any settlement should be a gradual, step-by-step process.⁷⁸

Potential redeployment of US nuclear weapons or further buildup of missile defence capabilities in the ROK would likely cause serious concern, given the close proximity to Russian borders, and could be perceived as a potential threat to Russia's national security.⁷⁹ The same reasoning would apply to any potential escalation in the level of nuclear exchange.⁸⁰

The collapse of the DPRK's regime is not in Russia's interest as this could cause a refugee crisis across its borders.⁸¹ Likewise, the reunification of the two Koreas under the ROK would likely not be perceived as in its interest. Russia would also be concerned if Seoul, a long time US ally protected by the US nuclear umbrella, agreed to host US military bases on a unified Korean Peninsula. The possibility of US nuclear arsenals and missile defence systems being deployed next to Russian territory, as noted above, would be a serious concern for Russian national security. If any of the above-mentioned scenarios were to eventuate, Russia would be likely to move from its current position to a more proactive one, taking action that would serve its interests.⁸²

Under existing agreements, Russia has no legal obligation to intervene in a military confrontation on the Korean Peninsula. There is no credible information as to whether any plans for intervention are being discussed by the government or the military. However, Russia has the potential to play the role of a mediator in the conflict as it maintains robust economic and diplomatic relations with both Koreas and with China.⁸³ Chairman Kim Jong Un paid an official visit to Russia in April 2019 to meet with President Vladimir Putin in Vladivostok. No joint statements were made or any bilateral agreements reached as a result of the meeting and all consultations were held in a closed setting.

Russia's commitment to tension de-escalation by means of political dialogue, which it is ready to facilitate, is reflected in Russia's *Foreign Policy Concept* (paragraph 89).⁸⁴ Current Russian Ambassador to the DPRK Alexander Matsegora, in an interview with *TASS International News Agency*, reconfirmed this commitment, stating that "Moscow will continue to promote our joint resolution with our Chinese partners and a phased *Action Plan* for a comprehensive parallel settlement of the problems of the Korean Peninsula, and will persuade all parties to refrain from taking drastic steps that could aggravate

the situation."⁸⁵ Russia's current position is to maintain neutrality and avoid open interference in DPRK-related conflicts. However, if tensions should escalate significantly, Russia may take more proactive measures.⁸⁶

F. United States

Despite its distance from the Korean Peninsula, the United States has a long military history in the region, not the least of which as an active participant in the Korean War and as an ally to both Japan and the ROK. It used nuclear weapons against Japan during World War II and threatened to use them against the DPRK, China and the former Soviet Union before and during the Korean War. The United States is second to Russia in the total number of nuclear weapons it possesses.⁸⁷ It is also the only country that maintains nuclear weapons in other host countries. The United States withdrew its tactical nuclear weapons from the ROK in 1991⁸⁸ and today maintains nuclear weapons only in several NATO States. Nonetheless, it is capable of delivering a variety of nuclear weapons to the region using ICBMs, SLBMs and bombers.

The United States' security strategy in the region is founded on its alliance system. As of 30 June 2020, the United States hosts 55,381 military personnel on active duty in Japan and 26,540 in the ROK,⁸⁹ making the US presence in the region larger than anywhere else in the world. The American military presence is intended to create a tripwire, meaning that an attack on the ROK or Japan would be regarded as an attack on the United States, as well.⁹⁰ While both mutual defence treaties stipulate that there should be "consultation" in the implementation of the respective treaties, it also provides each party "would act to meet the common danger in accordance with its constitutional processes." If US troops are attacked, response measures may therefore also be taken without consultation with or approval by its allies. In a case of explicit disapproval, the United States may simply choose to utilize its off-shore military assets from Guam or international waters.⁹¹

The United States maintains its presence not only to counter the rising threat from the DPRK but also to deter China and Russia, which it sees as strategic competitors.⁹² In addition to the deployment of its personnel, the United States is a major provider of conventional weapons to the

US ATOMIC THREATS DURING THE KOREAN WAR

US President Harry Truman famously would not renounce the use of nuclear weapons against China in 1950 in order to prevent them from entering the Korean War.ⁱ In 1952, Eisenhower also publicly entertained recommendations that United Nations troops use “small atomic bombs and artillery shells” during the Korean War.ⁱⁱ In 1954, General Curtis LeMay, Commander of the Strategic Air Command, said: “There are no suitable strategic air targets in Korea. However, I would drop a few bombs in proper places in China, Manchuria and Southeastern Russia.”ⁱⁱⁱ

- i *The President's News Conference*, Truman Library, 30 November 1950, available at: <https://www.trumanlibrary.gov/library/public-papers/295/presidents-news-conference>
- ii *Eisenhower Bars All-out War Now*, The New York Times, 6 December 1952, available at: https://timesmachine.nytimes.com/timesmachine/1952/12/06/84374678.pdf?pdf_redirect=true&ip=
- iii Lewis, John Wilson and Xue Litai, *China Builds the Bomb* (Stanford, 1988), p. 18.

region and has exported a significant quantity of advanced conventional weapons to Japan and the ROK.

The US nuclear deterrence strategy is at the core of its security strategy. The 2018 *US Nuclear Posture Review* called for a flexible, tailored nuclear deterrent strategy and the development of a diverse set of nuclear capabilities to deter multiple potential adversaries in different circumstances.⁹³ The US nuclear posture is based on a *strategic nuclear triad* which consists of submarines (SSBNs) armed with SLBMs, land-based ICBMs and strategic bombers carrying gravity bombs and air-launched cruise missiles. The strategic nuclear triad and non-strategic nuclear forces are positioned to be the key enablers of US deterrence strategies.

As of 2018, the United States operated 14 OHIO-class SSBNs, a minimum 12 of which were

slated to be replaced by new SSBNs.⁹⁴ The US ICBM force consisted of 400 single-warhead Minuteman III missiles deployed in underground silos and dispersed across several US states. The replacement of Minuteman III is slated to begin in 2029. The bomber leg of the triad consisted of 46 nuclear-capable B-52H strategic bombers equipped with air-launched cruise missiles and 20 nuclear-capable B-2A stealth strategic bombers.⁹⁵

In addition, the 2018 *US Nuclear Posture Review* stressed the importance of expanding flexible United States nuclear options to include low-yield weapons in order to ensure the credibility of deterrence against regional aggression. In this regard, the United States is in the process of deploying low-yield SLBMs and nuclear-armed submarine-launched cruise missiles, which “are designed to raise the threshold for adversarial nuclear weapons use.”⁹⁶ The 2018 *US Nuclear Posture Review* stipulates that the United States would:

only consider the employment of nuclear weapons in extreme circumstances to defend the vital interests of the United States, its allies, and partners. Extreme circumstances could include significant non-nuclear strategic attacks. Significant non-nuclear strategic attacks include, but are not limited to, attacks on the United States, allied, or partner civilian population or infrastructure, and attacks on United States or allied nuclear forces, their command and control, or warning and attack assessment capabilities.⁹⁷

The US missile defence system was originally introduced in East Asia to protect the United States and its allies against attacks from the DPRK.⁹⁸ However, China and Russia have criticized the US missile defence system as undermining strategic stability and argue that it will intensify strategic competition.⁹⁹

Regionally, the United States has deployed the Terminal High Altitude Area Defense (THAAD) to the ROK and the Patriot missile defence systems to the ROK and Japan.¹⁰⁰ United States and Japanese destroyers equipped with the Aegis missile defence system and standard missile variants are also capable of conducting ballistic missile defence operations.¹⁰¹

The US Ground-based Midcourse Defense System is designed to engage long-range ballistic missiles in the mid-course phase of flight using ground-based interceptors. The system is designed for defence against a limited ICBM attack from the DPRK.¹⁰² Forty ground-based interceptors are deployed at Fort Greely in Alaska, and four at Vandenberg Air Force Base in California. However, scant testing of this system due to continuous delays in the testing schedule means there is limited evidence on the basis of which to assess the system's efficacy. The programme has also experienced delays in development and cost overruns.¹⁰³ This programme has been challenged for giving Americans a false sense of security at a very high price.¹⁰⁴

According to the 2019 *US Defense Review*, the United States intends to study the feasibility of boost-phase interception by US F-35 stealth fighters armed with interceptor missiles.¹⁰⁵ It is also trying to advance its standard missile (SM-3 Block IIA) interceptors for ICBM interception. A probable test of such an interceptor against an ICBM representative of the DPRK's was initially announced for the summer of 2020, but appears to have been postponed to sometime in fiscal year 2020-2021.¹⁰⁶

The United States is the long-term ally and provider of a nuclear umbrella for Japan

and the ROK. Historically, it has sought to deepen security cooperation with its allies in view of the evolving military capabilities of China and the DPRK.¹⁰⁷ However, public skepticism about and discontent with the US commitment to the protection of its allies has increased with President Donald Trump's requests for military cost sharing.

President Trump publicly softened the US position on annual ROK-US joint military exercises, calling them "very provocative" and costly for the United States after the first summit meeting with Chairman Kim Jong Un in Singapore on 12 June 2018. The Trump administration has repeatedly demanded that the ROK significantly increase its payment for the costs of US Forces Korea. The standoff over the military cost-sharing agreement between the United States and the ROK resulted in temporary suspension of the payment for approximately half of the ROK workers at the US Forces Korea's military bases between April and June 2020, which adversely impacted the functioning of the bases.

As regards Japan, Japan-US security cooperation has advanced steadily in past years through joint exercises. President Trump refrained from denouncing the joint military exercises between the United States and Japan, but has criticized Japan for not sufficiently sharing the cost of US Forces in Japan. At the time of publication, Japan is also slated to start negotiations with the United States over an increase of the host nation's support for USFJ in late 2020.¹⁰⁸



Donald Trump and Kim Jong Un, Hanoi, February 2019. Credit: The White House

On 12 June 2018, President Trump held a summit meeting with DPRK Chairman Kim Jong Un in Singapore at which the two leaders signed an agreement on the issues of establishing “new US-DPRK relations”, “a lasting and stable peace regime on the Korean Peninsula”, “denuclearization of the Korean Peninsula” and recovering the remains of US prisoners of war and missing in action in the DPRK.¹⁰⁹ The two leaders also met on 27–28 February 2019 in Hanoi, Vietnam, and on 30 June 2019 in Panmunjom, DPRK. The summit meetings were followed by senior-level talks between the two countries to discuss the implementation of the Singapore agreement. Since June 2019, however, the bilateral talks have stalled.

On a number of occasions, Secretary of State Mike Pompeo has expressed hope that the DPRK leadership would continue negotiations that would lead to the DPRK’s “denuclearization.”¹¹⁰ On 29 June 2020, Deputy Secretary of State Stephen Biegun also stated: “We’ve laid out a quite robust and detailed plan that if the North Koreans would engage with us in negotiation we can make progress very quickly.”¹¹¹ On the other hand, the DPRK’s Foreign Ministry has expressed, on multiple occasions, its resentment against the United States’ “hostile policy towards the DPRK” and “disregard of the agreement” in Singapore, often referring to the continuation of the US-ROK joint military exercises, US demands for complete denuclearization of the DPRK and US sanctions against the DPRK. The DPRK has repeatedly expressed a lack of interest in further dialogue unless the United States changes its “hostile” posture.¹¹²

III. ESCALATION SCENARIOS

The long-lasting and deeply-rooted entanglement of the six countries referred to above makes the DPRK nuclear issue particularly difficult to manage. That issue will continue to pose a threat to regional security until a concerted effort by all parties is made to address underlying security questions.

In this section, four major crisis scenarios that could lead to a full-scale escalation of conflict are outlined: (1) a limited military exchange; (2) major changes in the military balance; (3) DPRK leadership crisis; and (4) natural disasters and accidents.

A. Limited Military Exchange

Limited military exchanges pose the greatest risk of escalation to a full-scale crisis on the Korean Peninsula. The party initiating a military crisis may do so deliberately or even accidentally. If done deliberately, the escalating party may mistakenly believe that it is able to control further escalation. However, its action may end up inviting a significant escalatory response from its adversary. A following tit-for-tat escalation may, indeed, bring a conflict close to a nuclear last resort if State survival is perceived to be at imminent risk or a calculation is made that the costs of reciprocated use would be lower than a continuation of a prolonged conventional interaction. It may be appealing for a conflict party to believe in its ability for escalation dominance (or the ability to escalate the conflict in ways that will be costly to the adversary) even though it could carry unforeseeable consequences with it. Human error, uncertainty, misinterpretation and miscalculation could intensify and escalate tension to a new level that could spin dangerously out of control.

The risk of early nuclear use may arguably be particularly high in the case of the DPRK because of its less established and less credible second-strike capability. As such, it may attempt to seek fast, operational advantages by striking key targets in the region, which in turn would slow down troop reinforcements to the peninsula. At the same time, the United States has publicly contemplated a preemptive strike.

The following triggers are understood as specific military activities that would be regarded by the initiator's adversary as "crossing a redline" and requiring military retaliation, thus resulting in a limited military exchange with significant escalatory risks. ONN defines a military "redline" as a territorial boundary or other limit to military action which should not be crossed by an adversary. In order to pressure adversaries and to allow for some flexibility for both strategic reasons and political expediency, leaders often do not define a redline or the extent to which they are willing to retaliate if an adversary is perceived to cross it. This policy tactic of "leaving something to the imagination" can pay off if adversaries correctly understand the redline and believe the consequences of crossing it to be too costly to be worth it. However, unspoken and undefined redlines can be very risky in conflict escalation. If the adversary either does not understand the redline or incorrectly believes that there will be little or no retaliation, conflict can escalate suddenly and with dangerous results. Additionally, leaders who either declare or face a publicly declared redline can feel compelled to escalate conflict or risk looking impotent to their own constituents.

1. Crossing United States' Redlines

The United States and the DPRK have engaged in a series of low- and high-risk confrontations since the *Armistice Agreement*. At times, these confrontations have included economic, diplomatic and military domains. While some of the confrontations last for years, they can be seasonal as well. No US President has publicly declared an unambiguous redline tied to military retaliation vis-à-vis the DPRK. Nevertheless, it is reasonable to assume that any targeting of US troops and allies, civilians, critical infrastructure or high-value military assets would be regarded as an act of war. The DPRK has refrained from directly attacking US personnel or assets since the shooting down of a US helicopter in 1994.¹¹³ Recent high tensions between the DPRK and the United States in 2017, however, illustrate the continued risk of a trigger of this nature. Following President Trump's declaration on 8 August 2017 that "North Korea best not make any more threats to the United States — they will be met with fire and fury like the world has never seen,"¹¹⁴ the DPRK's Korean People's Army threatened to make an "enveloping fire at the areas around Guam with medium- to long-range



Kim Jong Un presides over meeting of Supreme Command, Pyongyang, 29 March 2013. Credit: KCNA

strategic ballistic rocket Hwasong-12 in order to contain the US major military bases on Guam, including the Andersen Air Force base.¹¹⁵ A return to such highly bellicose verbal exchanges and actual execution of similar threats would carry a high risk of a military conflict with it.

One of the most famous past examples of how a relatively small military incident between the DPRK and the United States could lead to escalated military exchange is known as the demilitarized zone (DMZ) axe murder incident. On 18 August 1976, DMZ Joint Security Area Captain Arthur G. Bonifas and a United Nations Command security officer, Lt. Mark T. Barrett, were slain by DPRK soldiers with axes. The two belonged to a group of ROK and US personnel attempting to trim a tree blocking the line of sight between two outposts. The DPRK soldiers claimed that the tree was planted by Kim Il Sung.¹¹⁶ On 19 August, local US troops increased readiness to DEFCON 3, while a number of military retaliation options were considered, including artillery strike and bombing. Finally, the United States decided to cut the tree with the protection of overwhelming force. Operation Paul Bunyan was carried out on 21 August. The United Nations Command Camp Kitty Hawk was renamed Camp Bonifas on 18 August 1986 in honour of Captain Bonifas. The incident shows how a seemingly small event such as trimming

a tree¹¹⁷ could trigger a chain reaction that, without efforts to de-escalate, could eventually endanger the whole region.

As evidenced by a recent incident in January 2020 when Ukraine International Airlines Flight 752 was shot down by Iranian armed forces, there is always a risk that, because of poor judgement or unclear rules of engagement, military personnel might mistakenly engage a false target, with grave consequences. Hypothetically, a DPRK surface-to-air missile unit¹¹⁸ could react to intelligence of an enemy aircraft within firing range. A jittery missile operator might send missiles airborne without authorisation and could bring down a reconnaissance US aircraft. Alternatively, a nervous or aggressive pilot, who has near-complete autonomy over the aircraft, might launch an attack when attempting to drive away a US plane.

Be it intentional or accidental, the result could be similar to the 1969 EC-121 incident, in which DPRK MiG pilots were alleged to have intentionally brought down a US EC-121 reconnaissance plane.¹¹⁹ The incident cost the lives of 31 aircrew members of the US Navy, but the United States did not retaliate. If such an incident were to happen again, a physical US response could be swift and devastating. The most recent air encounter acknowledged by the

United States between a DPRK fighter and a US aircraft happened on 30 June 2003, when at least two DPRK air-to-air missile armed MiG-29s intercepted a US strategic reconnaissance aircraft.¹²⁰

2. Crossing DPRK's Redlines

Without setting any explicit redline tied to military consequences, the DPRK has reiterated that any act considered to be a form of aggression will be met with devastating military countermeasures. On the basis of its past response patterns to perceived forms of aggression, it is reasonable to assume that the DPRK's tolerance level is lower than that of its counterparts. This is arguably because of its more acute concerns over regime survival in the event that overwhelming military forces of its adversaries are able to exploit first-mover advantages in an initial aggression scenario.

As Washington's frustration over the lack of progress in the denuclearization process deepens and the DPRK's capabilities grow, the United States could opt for limited conventional strikes against key DPRK military installations during a confrontational phase or in response to weapon tests. Similar proposals, dubbed *bloody nose strikes*, surfaced in late 2017 and early 2018 during H.R. McMaster's tenure as National Security Adviser.

Reporting from the *Wall Street Journal* and *The New York Times* on internal deliberations within the Trump administration during this time pointed to increased debate on the merits of limited strikes, with McMaster leading the push for a military option.¹²¹ This was reflected in his public statements, which treated considerations of military options seriously.¹²²

The general goal of a bloody nose strike would be to carry out a significant military attack that would cause the DPRK to reconsider the expansion of its nuclear programme or cause significant damage to the programme infrastructure itself. While the approximate size and composition of such an attack is not known, in part

because the Trump administration has not directly advocated such a policy,¹²³ the idea is that it would be large enough to achieve the aforementioned goals but small enough to not provoke a full-scale military response from the DPRK.

Less risky measures could include deploying US offensive cyber capabilities against the DPRK to disrupt missile testing activities or to apply pressure on Pyongyang. The non-kinetic options seemed to include at least infecting the enemy command and control networks. The option was deemed a cost-effective way (compared to missile interceptors)¹²⁴ to stop the DPRK missile testing activities but blurred the line between missile interception and counter-force, a military operation aimed at neutralizing the enemy's nuclear weapon capability.¹²⁵ Thus, if the DPRK were to believe that its missiles would be neutralized by this operation, it might consider itself at war with the United States, risking escalatory moves from Pyongyang.

Joint exercises between the United States and its allies in the region could also be triggers for a limited military exchange with the DPRK. The major US-ROK field training exercise was the *Key Resolve* (formerly called *Team Spirit*) series that began in 1976 and grew to nearly 200,000 ROK and US participants commensurate with increased perceptions of a DPRK threat. Since 2001, *Key Resolve* has been combined with the *Foal Eagle* field training exercise. In 2019, the ROK and the United States suspended the *Key Resolve* and *Foal Eagle* exercise and introduced a downscaled exercise called *Dong Maeng*, which is designed to reduce tension and support diplomatic efforts to achieve denuclearization on the peninsula.¹²⁶

Separate ROK and US command post exercises were combined as the Ulchi Focus Lens in 1976. The drill was later changed to *Ulchi Freedom Guardian*, which is an annual joint and combined simulation-supported command post exercise that trains Combined Forces Command personnel and major component, subordinate and augmenting

DPRK State media frequently warns that the enemies will be dealt devastating physical blows if they intrude into the DPRK "even by 0.001 mm."

See, for example, *DPRK military says prepares to launch a sacred war*, KCNA, 23 December 2010.

US NATIONAL SECURITY ADVISORS AND THE PUSH FOR A MILITARY OPTION

H. R. McMaster described a situation in which the DPRK could threaten the US with nuclear weapons as unacceptable, while also stating that improvements to the DPRK nuclear and missile programmes made conflict more likely.ⁱ

McMaster's successor as National Security Adviser, John Bolton, generally shared this view, writing in an op-ed for the *Wall Street Journal* shortly before joining the Trump administration that the US should engage in preemptive strikes against the DPRK before the country's ability to strike the US was solidified.ⁱⁱ He later echoed McMaster's view that negotiations were largely an attempt by the DPRK to buy time to develop its nuclear programme, and generally characterized the use of military force as a "less bad" option than allowing the DPRK to have nuclear weapons.ⁱⁱⁱ

While the reality of US policy was characterized to a greater extent by expansion of US sanctions and high-level negotiations, the weight these more militaristic views were given can be seen in the Trump administration's personnel decisions. For instance, shortly before he was to be appointed US Ambassador to South Korea, Victor Cha was abruptly withdrawn from consideration for the post, reportedly for objecting to the consideration of limited military strikes on the DPRK.^{iv}

- i *Luncheon with National Security Advisor Lt. General H.R. McMaster - 2017 Reagan National Defense Forum*, 3 December 2017, video available at: <https://www.youtube.com/watch?v=VwBrGNiZlY>
- ii John Bolton, *The Legal Case for Striking North Korea First*, *The Wall Street Journal*, 28 February 2018, available at: <https://www.wsj.com/articles/the-legal-case-for-striking-north-korea-first-1519862374>
- iii *Interview: Trump-Kim Talks to be 'A Very Short Meeting' if Pyongyang Won't Discuss Denuclearization*, *Radio Free Asia*, 23 March 2018, available at: <https://www.rfa.org/english/news/korea/interview-bolton-03232018130326.html>
- iv David Nakamura, Anne Gearan, *Disagreement on North Korea Policy Derails White House Choice for Ambassador to South Korea*, *The Washington Post*, 30 January 2018, available at: https://www.washingtonpost.com/politics/disagreement-on-north-korea-policy-could-derail-white-house-choice-for-ambassador-to-south-korea/2018/01/30/3a21191c-05da-11e8-94e8-e8b8600ade23_story.html

staff. In 2019, after summit talks, this exercise was reportedly replaced by a smaller, unmanned one.¹²⁷ Frequent no-notice alerts, musters and readiness inspections help insure combat preparedness of the ROK and US forces, according to the USFK.¹²⁸

The joint military exercises could be perceived as war preparation against the DPRK. In numerous documents, the DPRK accuses the "aggressive and dangerous" joint military exercises as preparation for military invasion against it.¹²⁹ Increasingly, the DPRK is conducting its own exercises. In heightened tensions, the DPRK could roll out multiple intercontinental ballistic missiles from shelters and put them on high alert. It might just be a training exercise or a show of force rather than the beginning of conflict. In the 2013 confrontation period, the DPRK reportedly deployed one or two Hwasong-10/Musudan mid-range missiles to an east coast launch site in early

April.¹³⁰ The missiles stayed at launch-ready status for about a month before being moved away.¹³¹ If the DPRK were to repeat this tactic, the signal could be misinterpreted by the United States and its allies as a sign of an impending strike.

The United States has also been conducting annual joint military exercises with Japan. When tension on the Korean Peninsula escalated in 2017, the Japanese Self-Defense Forces and US Forces carried out at least 57 joint military exercises.¹³² The joint exercises included air defence combat training, aerial refuelling, joint naval cruising and minesweeping, which continued into 2018, when joint exercises for air and missile defence were added in February. Japan-US security cooperation has occasionally also involved the participation of the ROK. For example, the three countries conducted ballistic-missile information-sharing exercises in waters around Japan in October and December 2017.¹³³



US Carl Vinson Carrier Strike Group and Republic of Korea Navy, May 2017. Credit: U.S. Indo-Pacific Command

The DPRK has also reacted strongly to the US-Japan joint military exercises and the deployment of US Forces to East Asia. In 2017, the DPRK stated its intention to attack the US military bases in Japan and implied it would attack other targets in the country. In May 2017, the spokesperson of the DPRK Foreign Ministry stated: "Only the US military objects for aggression [towards the DPRK deployed] in Japan have been within the optical sight of the Strategic Force of the Korean People's Army, but if Japan is hostile towards the DPRK following the US, not properly seeing the reality, the target of the DPRK will be changed."¹³⁴ In August and September 2016 and in March 2017, the DPRK conducted a series of ballistic missile launches into Japan's exclusive economic zone or near it.¹³⁵

During heightened tension on the Korean Peninsula, the DPRK could launch another round of ballistic missiles targeting some locations within Japan's exclusive economic zone or the seas near it. The ballistic missiles could accidentally land on Japan's vessels or territory. Or, if the DPRK felt significantly threatened by the prospect of imminent US deployment of forces from Japan to the Korean Peninsula, especially involving US strategic weapons, the DPRK might use nuclear-capable ballistic missiles to attack US military bases or other valued or military targets on Japan's territories. The DPRK's ballistic missile attack would constitute an armed attack against Japan, which could activate the Japan-US joint military operations against the DPRK's ballistic missile sites, pursuant to the bilateral agreement under the *Japan-US Security Treaty*.¹³⁶

Alternatively, if Japan felt threatened by possible DPRK nuclear-capable ballistic-missile attacks, Japan could refuse to cooperate with US Forces. Should Japan not allow US Forces to use Japan's territorial land, seas or airspace, US Forces' operations could be significantly affected. In particular, the conventional leg of the escalation ladder for the United States could be weakened, leaving it with only a relatively limited set of options available, possibly including the use of tactical nuclear weapons.

Any military response from Japan and the United States against the DPRK would trigger strong reactions from China, Russia and likely the ROK. The military conflict on the Korean Peninsula could generate region-wide uncertainties and possibly develop into a region-wide arms race or even conflict.

3. Crossing Inter-Korean Redlines

The region is familiar with limited confrontation between the DPRK and the ROK. Such interactions often happen at or across the *Military Demarcation Line* and the *Northern Limit Line* or in disputed areas that have been established as buffer zones in the *Comprehensive Military Agreement*. While no explicit and public inter-Korean redlines tied to military retaliation exist, it is reasonable here to distinguish possible no-tolerance activities that are distinct in their nature from those that would be regarded differently in, for example, the DPRK-US context. Clear transgressions may encompass conventional targeting and strikes ranging from one-off with no casualties (e.g. testing in

buffer zone with complaint from the other) to a reciprocated military action with casualties such as the shelling of Yeonpyeong Island in 2010.

If an extended period of reciprocated military action escalates into prolonged and sustained military interaction, it would be the most significant and unprecedented development since the signing of the *Armistice Agreement* in 1953. This would most likely increase the number of casualties drastically by also including civilian non-combatants and develop into a high-risk, high-stake situation where both parties could expect a further rapid escalation from the other. Under the current arrangement of ROK-US Combined Forces Command, USFK would be directly involved in the conflict, in which US soldiers could incur heavy casualties.

In addition, the DPRK has a record of high-level assassination attempts targeting South Koreans. Most notably, a commando of KPA soldiers infiltrated the Blue House in what then became known as the *Blue House Raid*, an unsuccessful attempt to assassinate then-ROK President Park Chung-hee in 1968.¹³⁷ In 1983, the DPRK also conducted an assassination attempt against ROK President Chun Doo-hwan with a bombing in Yangon, Myanmar. Though President Chun survived, dozens of other high-level ministers and civilians died.¹³⁸ While there is no indication that the DPRK will conduct another high-level assassination attempt, the assassination of Kim Jong Un's older half-brother, Kim Jong Nam, at a busy international airport in Malaysia in 2017, does not rule out this possibility, either.

High intensity provocations or incidents mentioned above may not necessarily escalate to nuclear use but could do so. One could assume that if such extreme scenarios were to eventuate, the time for each party to de-escalate would be very short and the danger of a total war would loom large, especially if the ROK military followed its principle of disproportionate retaliations in a high-intensity conflict. Similarly, the DPRK's testing pattern for short- to mid-range missiles, as described above, seems to indicate that it could use nuclear weapons early in a conflict.

A particularly high risk of conflict exists in the disputed waters off the western coast of the two Koreas (see Figure 2 below). While both the DPRK and the ROK recognize — as stipulated in the 1953 *Armistice Agreement* — the Military

Then-ROK Chairman of the Joint Chiefs of Staff Choi Yoon-hee indicated that the ROK's manual on rules of engagement had, since 2014, included a principle of “punishment 3-5 times” the amount of a provocation (in possible conflict with the proportionality principle under the United Nations Command's rules of engagement). Previously, the concept of “swiftness, accuracy, and sufficiency” in responding were introduced after the shelling incident of Yeonpyeong Island in 2010.

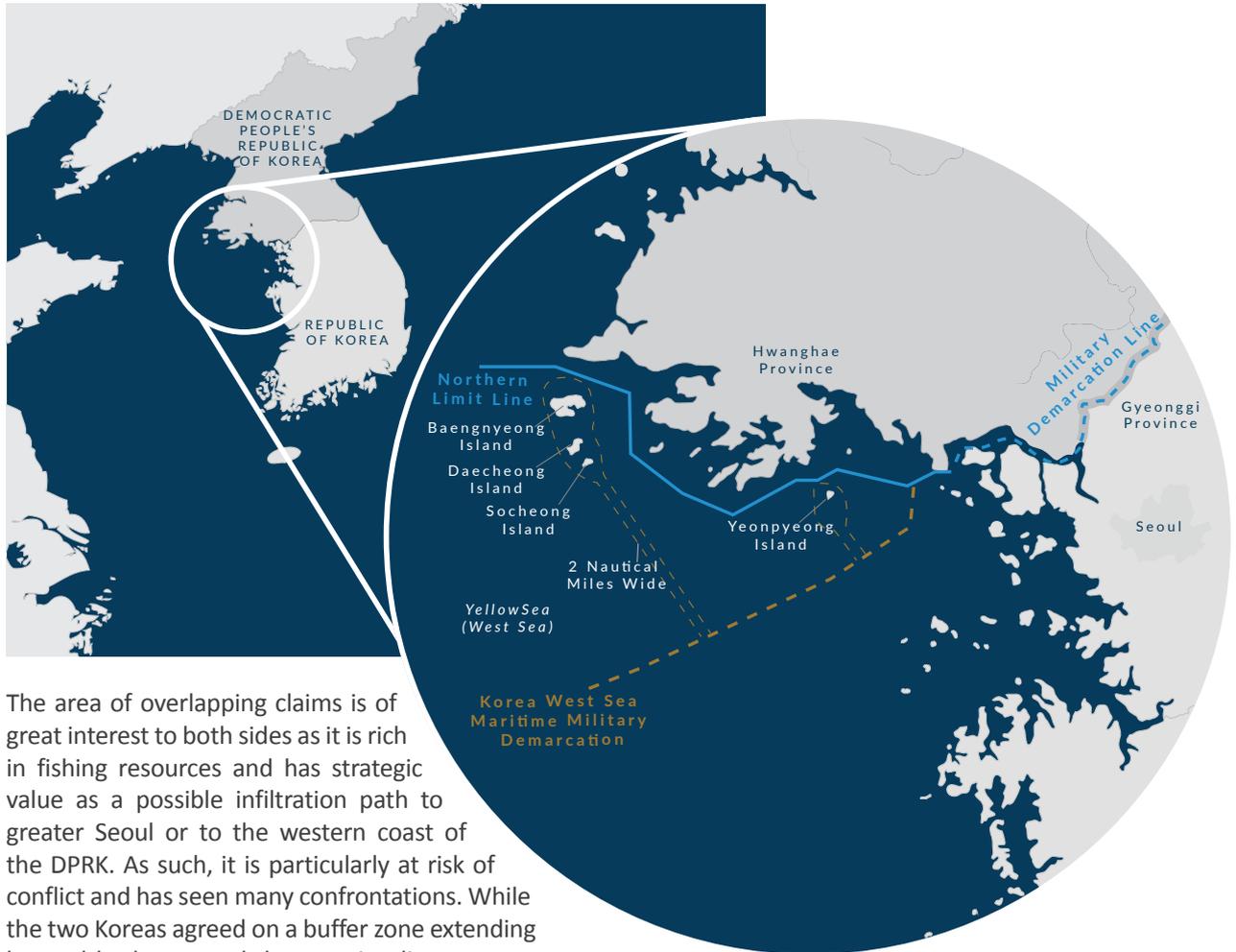
See also: Park Beungyong, 한국군 ‘북한 도발에 ‘충분한 응징 원칙’ 정립’ [South Korean Military Established “Sufficient Principle of Punishment” for North Korean Provocations], Voice of America (VOA) Korea, 1 April 2014, available at: <https://www.voakorea.com/korea/korea-politics/1883639>

Demarcation Line as the land border between the two, there is no such undisputed maritime demarcation for the adjacent coastal waters. The *Armistice Agreement* states that both States are to “respect the waters contiguous to the demilitarized zone and to the land area of Korea under the military control of the other side.”¹³⁹ Specific boundaries in those waters, however, were not agreed upon. The ROK's position is that the *Northern Limit Line*, first established in 1961 by the then United States Commander Naval Forces,¹⁴⁰ is the *de facto* boundary, while the DPRK has, since 1999, asserted that what it calls the “Korean West Sea *Maritime Military Demarcation*”, further to the south of the *Northern Limit Line*, is the boundary that should be respected.



Then-South Korean Defense Minister Song Young-moo and then-DPRK Minister of the People's Armed Forces No Kwang Chol at signing of Comprehensive Military Agreement, 19 September 2018. Credit: Blue House

FIGURE 2. MAP SHOWING OVERLAPPING CLAIMS IN WEST SEA OR YELLOW SEA
dotted yellow line marks DPRK's "Korea West Sea Maritime Military Demarcation"; blue line marks ROK's "Northern Limit Line". Adapted from: Yonhap News Agency



The area of overlapping claims is of great interest to both sides as it is rich in fishing resources and has strategic value as a possible infiltration path to greater Seoul or to the western coast of the DPRK. As such, it is particularly at risk of conflict and has seen many confrontations. While the two Koreas agreed on a buffer zone extending beyond both asserted demarcation lines as part of the 2018 *Comprehensive Military Agreement*, alleged violations on both sides in 2019 and 2020 and harsh criticism by the DPRK have left the effectiveness of the agreement in doubt.

Notable naval skirmishes there include the first and second battles of Yeonpyeong in 1999 and 2002, respectively, when incursions by DPRK patrol ships beyond the *Northern Limit Line* resulted in mutual engagement and significant casualties on both sides. In 2009, in a similar incident closer to the island of Daecheong, the two navies again exchanged fire over alleged incursions, reportedly causing partial destruction of one DPRK patrol ship and possible deaths.

Two more recent incidents are worthy of further scrutiny because of the high risk of further escalation. On 26 March 2010, the ROK's *Cheonan*, a Pohang class frigate, sank close to Baengnyeong Island when it was on patrol within

the disputed maritime zone set by the *Northern Limit Line* and the *Maritime Military Demarcation*. Forty-six ROK sailors lost their lives in the incident. Initially, the ROK government announced that there was no evidence of the DPRK's culpability.¹⁴¹ The DPRK denied any involvement, criticized the investigative process as biased and demanded that its own investigative team receive access to the scene.¹⁴² The DPRK later issued warnings of a "physical response" should joint exercises in the area continue and of its willingness to "fight a real war" should the ROK not respond to its demands for dialogue.¹⁴³

Two months after the incident, a Joint Civilian-Military Investigation Group led by the ROK with experts from the United States, Australia, the United Kingdom and Sweden judged in no uncertain terms that the frigate was sunk by a DPRK CHT-02D torpedo fired by a DPRK



Yeonpyeong Island shelling, 2010. Credit: Ministry of National Defense, ROK

submarine and that there could be “no other plausible explanation”.¹⁴⁴ These findings were contested by a Russian navy expert team sent to the ROK at the time,¹⁴⁵ and also questioned in a number of scientific publications since then.¹⁴⁶ The ROK’s military did not retaliate swiftly precisely because there remained — and arguably still remains — uncertainty with regard to the nature of the incident. If hard evidence attributing it to the DPRK had emerged immediately or shortly after the incident, the risk of escalation could have been much higher.

Only a few months after the March 2010 *Cheonan* incident, the DPRK openly attacked Yeonpyeong Island on 23 November 2010 in response to the large-scale ROK military *Hoguk Exercises* and live-fire drills it regarded as threatening, issuing a complaint warning that it would not just sit back if shots were fired into its waters.¹⁴⁷ The exercises went ahead and the DPRK responded to what it then called a “decisive self-defensive measure to cope with the enemy’s reckless military provocation of firing shells inside the territorial waters of the DPRK.”¹⁴⁸ Two ROK marines and two civilians were killed, while another 15 marines and three civilians were wounded. The DPRK never published the number of casualties brought about by the ROK’s responsive strike with K-9 self-propelled howitzers. The incident was unique in that it was the first time since the armistice for the KPA to directly and indiscriminately target

territory under South Korean control.

Significant changes in the ROK’s doctrinal thinking on deterrence and rules of engagement following the *Cheonan* and *Yeonpyeong Island* incidents suggest that recurrence of a similar incident would put pressure on the ROK to respond more swiftly and devastatingly.¹⁴⁹

B. Major Changes in Military Balance

Shifts in military balance could lead to conflicts on the peninsula. Pyongyang’s buildup of nuclear capabilities and US troop withdrawal could embolden Pyongyang to take more provocative action against the ROK and other allies, increasing the likelihood of a conflict. On the other hand, as discussed previously, the DPRK’s advancement in nuclear weapon development in itself could become a source of frustration that might push the US administration into adopting high risk military operations. Redeployment of US nuclear weapons to the ROK, growth in offensive military capabilities by Japan and the ROK could also increase the risk of nuclear use due to misdirection and miscalculation. It is possible that Japan may carry out preemptive strikes if it believes that a DPRK attack is imminent. Thus, ONN considers the following changes in the military presence and capabilities of relevant parties as triggers for possible conflict scenarios.

1. Nuclear and Missile Testing

The DPRK has several more avenues to further develop its nuclear weapon programme quantitatively and qualitatively. On 1 January 2018, Chairman Kim Jong Un announced that “the nuclear weapon research sector and the rocket industry should mass-produce nuclear warheads and ballistic missiles, the power and reliability of which have already been proved to the full, to give a spur to the efforts for deploying them for action.”¹⁵⁰ It is not clear when the DPRK itself will feel that its nuclear deterrent is sufficient. According to a KCNA report published on 24 May 2020, the Seventh Central Military Commission of the DPRK’s Workers’ Party of Korea (WPK) decided on “further increasing the nuclear war deterrence of the country and putting the strategic armed forces on a high alert operation.”¹⁵¹

In the face of considerable US skepticism about the credibility of the DPRK’s nuclear deterrent, the DPRK might decide to conduct an atmospheric nuclear test, launching a live nuclear warhead on an intermediate or intercontinental ballistic missile or conducting an anti-satellite test with a nuclear warhead.¹⁵² Such a nuclear detonation would be highly provocative worldwide. Alternatively, DPRK could simply resume long-range missile flight tests in highly lofted trajectories and underground nuclear testing to further verify and improve the reliability of its strategic nuclear weapons.

Given that President Trump frequently cites a moratorium on testing nuclear weapons and long-range ballistic missiles as a personal achievement, it is possible that these play a core part in his expectations towards his counterpart. Following the conciliatory engagements in 2018 and 2019, however, Trump has invoked the possibility of a “breach of trust” in his personal relationship with Chairman Kim Jong Un as necessary for course redirection in his stance towards the DPRK. While it is unclear precisely what elements this *trust* encompasses, he has said that short-range missile tests are not part of it.¹⁵³ However, these moratoria are perceived by the DPRK as strictly self-imposed and unilateral “commitment to which there is no opposite party.”¹⁵⁴ In late December 2019, the Chairman Kim reportedly stated: “the DPRK has found no grounds to be unilaterally bound any longer by the commitment”, indicating that both moratoria were terminated.¹⁵⁵

Unlike their liquid-fuel ICBMs, the DPRK’s solid-fuel missiles do not currently pose a direct threat to the continental United States. However, the solid-fuel missiles are a growing threat to the region. In 2017, the DPRK tested its Pukguksong-3 submarine-launched ballistic missile (SLBM) in a highly lofted trajectory. The missile is estimated to have a range of about 2,000 km, making it the longest range solid-fuel missile the DPRK has tested to date. However, Trump did not denounce



Kim Jong Un inspects a purported thermonuclear bomb, 3 September 2017. Credit: KCNA

the test as breaching his trust. In August 2019, when commenting on the DPRK's more recent short-range missile tests in 2019, he said that a moratorium on testing short-range missiles was not part of any agreement with the DPRK.¹⁵⁶

The practice of only making vague allusions to breaches of trust might lead to a dangerous perception by the DPRK that a preventive military strike against it is an assured impossibility. This might embolden Pyongyang into more nuclear-weapon-related activities. ONN will continue to monitor indicators for possible DPRK nuclear-weapon-related testing activities.

On the other hand, the United States is investing in more advanced strategic weapons such as hypersonic missiles and new types of intermediate-range ballistic missiles and is considering deploying them to the Asia-Pacific region. The DPRK might see this weapon research, development and deployment as a military threat. In response, Pyongyang might choose to further bolster its nuclear offensive capabilities.

2. United States Troop Withdrawal

The number of US troops in the ROK has gradually dropped from ~75,000 in 1955¹⁵⁷ to over 26,000 in 2020.¹⁵⁸ Traditionally, complete US troop withdrawal is seen as a long-lasting policy goal of Pyongyang.¹⁵⁹ It has, however, been reported that US troop withdrawal was not demanded by the DPRK at the working-level talks following the DPRK-US summits.¹⁶⁰ Public support in the ROK for the alliance, continued military presence and confidence

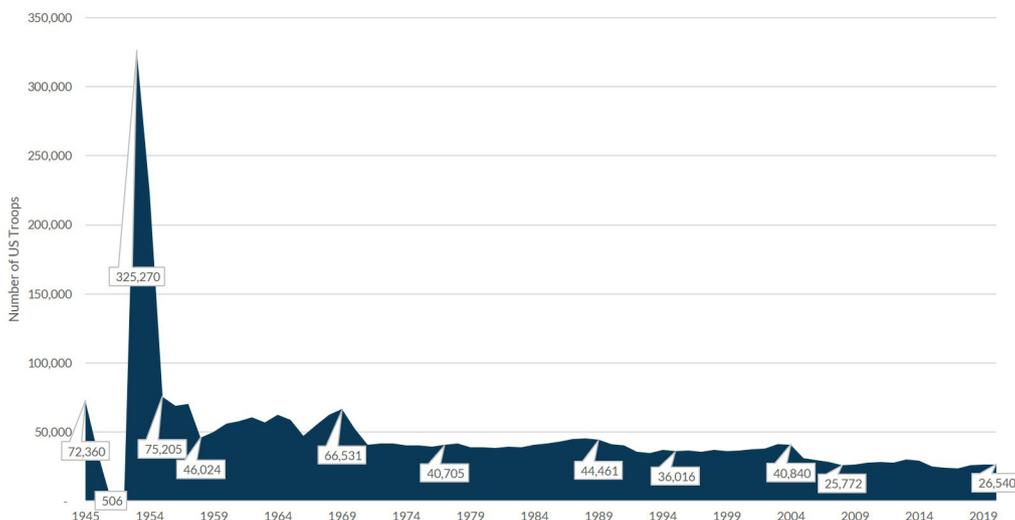
in mutual defence provision remains high.¹⁶¹ According to a poll conducted in 2020, 74 per cent of respondents supported the long-term stationing of US troops in the country and 82 per cent said that they were very or somewhat confident in the US commitment to defend the ROK.¹⁶²

While President Trump is reported to have strong inclinations for reducing the physical military footprint of US forces overseas, including that in the ROK,¹⁶³ complete withdrawal remains an unlikely scenario in the near future. Any withdrawal would require a number of years and massive funding to move personnel, infrastructure and equipment that has been present for decades. According to the latest 2020 US *National Defense Authorization Act* (NDAA), the funds that would be required for troop reduction below 28,500 (including national guard/reserve and civilian personnel) may only be appropriated by the US Government 90 days following a certification by the US Secretary of Defense that:

- (1) Such a reduction is in the national security interest of the United States and will not significantly undermine the security of United States allies in the region.
- (2) The Secretary has appropriately consulted with allies of the United States, including South Korea and Japan, regarding such a reduction.¹⁶⁴

Unilateral troop withdrawal could leave US allies unprepared for a major conflict with the DPRK. If continued withdrawal of US troops reaches a yet

FIGURE 3. US TROOP LEVELS IN ROK, 1945-2020



Active duty military personnel stationed ashore (where specified) as of 30 June (1945-1957, 2020) and September 30 (1957-2019), no official data available for 1951 and 1952. For source, see endnote 157.

unknown threshold, it could be perceived by the DPRK as an opportunity for forced reunification or, at least, embolden the DPRK to provoke major incidents that could lead to armed conflict. Also, troop withdrawal would most certainly be accompanied or followed by a large increase in the conventional military buildup by the ROK. Moreover, under a certain set of conditions that include heightened threat perception by the DPRK, weakened credibility of US extended deterrence commitments and strong domestic elite and public support, the possibility of the ROK conducting serious exploration of developing its own nuclear weapon programme cannot be excluded. The following section explores the possibility of a redeployment of US nuclear weapons, which may occur following troop withdrawal as a way to compensate for the significant change in the military balance.

3. Redeployment of United States' Nuclear Weapons

The question of whether US tactical nuclear weapons should be returned to the Korean Peninsula has arisen frequently in the ROK. The United States withdrew its nuclear weapons,

which had been deployed in the ROK from 1958 to 1991, amid talks with the DPRK on allowing inspections by the International Atomic Energy Agency (IAEA) and following then-President Bush's *Presidential Nuclear Initiatives* to reduce forward deployed tactical nuclear weapons around the world.¹⁶⁵

Since the early 1990s, however, mostly conservative-leaning politicians and other public figures in the ROK have periodically argued that the redeployment of US nuclear weapons could send a strong signal of re-enhancement of the ROK-US alliance and deterrence vis-à-vis the DPRK.¹⁶⁶

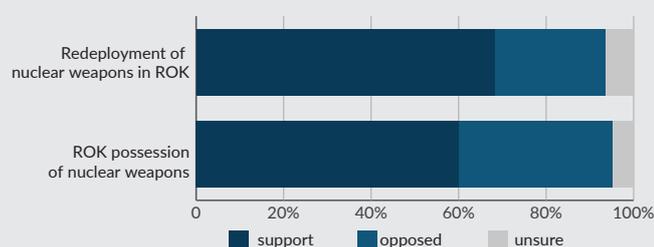
Advocacy and public support is stronger during periods of high tension and when there are fears of abandonment, such as when there are serious concerns over the possibility of a partial or complete US troop withdrawal.¹⁶⁷ From a purely technical perspective, however, benefits from redeployment would not be significant as the US can already effectively deliver nuclear warheads to the DPRK and, for example, sea-based options would be less risky and less costly. Additionally, rotational deployment of US strategic assets already ensures elevated responsiveness to an

SOUTH KOREAN PUBLIC OPINION ON "GOING NUCLEAR"

A 2017 poll found that 68.2 per cent of South Koreans support redeployment of tactical nuclear weapons, while 25.4 per cent opposed.ⁱ The South Korean public has a largely positive view towards (re-)introducing nuclear weapons as reflected in, for example, another 2017 poll concluding that 60 per cent of South Koreans support possession, while only 35 per cent are opposedⁱⁱ.

It is important to note that such polling results likely do not reflect the public's real views. Results are highly influenced by the level of inter-Korean tension and polls themselves are usually conducted during periods of heightened tension. It is reasonable to believe that most are also unaware of the significant costs and added risks such decisions would necessarily come with.

RESULTS OF 2017 POLLS



i 2017 년 9월 정기여론조사 4 - 대북문제 및 사드배치 찬반 등 [September 2017 Public Opinion Survey 4 - Support and Opposition on the North Korea Issue and THAAD Deployment], Korea Society Opinion Institute, 10 September 2017, available at: <http://ksoi.org/news-view.php?nno=58>.

ii 데일리 오피니언 제 275호(2017년 9월 1주) - 6차 핵실험과 대북 관계 [Daily Opinion Survey No. 275 (1 September 2017) - Sixth Nuclear Test and Relations with North Korea], Gallup Korea, 7 September 2017, available at: <http://www.gallup.co.kr/gallupdb/reportContent.asp?seqNo=860>

arguably sufficient level.¹⁶⁸ The re-deployment would likely trigger escalatory moves from the DPRK, and also result in strong countermeasures from China, considering Beijing's previous retaliatory actions against ROK businesses over the THAAD deployment.¹⁶⁹

4. Conventional Military Buildup in ROK

Advancement in the ROK's military planning and capabilities may also destabilize the military balance, increasing the risk of a conflict. For example, the DPRK may feel threatened by the conceptual planning and training, such as that under the KMPR, and the associated modernization planning, especially when its ageing conventional military force is increasingly helpless against a modern ROK force. Pyongyang may, in turn, invest in more nuclear weapons for deterrence purposes, which would be seen as requiring increased military modernization by the ROK.

Apart from the obvious conventional military advantage enjoyed by the ROK in the air, at sea and on land, it is an often overlooked fact that it is the ROK that possesses a superior arsenal of short-range ballistic missiles in both quality and quantity, not the DPRK.¹⁷⁰ The ROK Hyunmoo-2 series ballistic missiles and the Korea tactical surface-to-surface missiles can strike the DPRK's entire territory with pinpoint accuracy, as shown in videos released by the ROK government. In a latest development in March 2020, the ROK reportedly test launched a missile believed to be the Hyunmoo-4, which can be armed with a heavy warhead that weighs two tons.¹⁷¹ This missile referred to by South Korean media as "Frankenstein" is understood to be a dedicated super bunker buster that can penetrate any bunker where the supreme DPRK leadership may reside during an armed conflict.¹⁷²

In general, the conventional military superiority of the ROK military is overwhelming and recent investment and development plans suggest that this conventional superiority will continue to grow.¹⁷³ This, however, may create a dangerous paradox in which the DPRK may feel forced to further advance its nuclear capabilities to deter the perceived asymmetric conventional military threat that can, albeit non-nuclear, obliterate its top leadership. The associated risk of conflict escalation to nuclear use will persist, if not grow, in this case.

5. Pursuit of Offensive Capabilities by Japan

Recently, Japan planned to introduce a land-based anti-ballistic missile system Aegis ashore, but then suspended the plan in June 2020 due to difficulty in obtaining local consent for its deployment.¹⁷⁴ As of July 2020, Japan continued to explore alternative options to strengthen its missile defence capabilities in the light of the development of new missiles by the DPRK and China. In the future, Japan might decide to acquire capabilities to undertake a retaliatory strike against DPRK launchers and other military facilities if it were attacked by North Korean ballistic missiles and if a second attack were imminent. Japan might pursue offensive capabilities independently or in collaboration with the United States. Either way, should Japan decide to pursue its own offensive capabilities, the surrounding countries, especially the DPRK, China and the ROK, might respond by developing or expanding their military capabilities to preempt Japan's offensive capabilities, which could contribute to furthering an arms race in East Asia.

In a future crisis, should Japan deploy and actually use offensive military capabilities against the DPRK independently, it could complicate the ability of the United States and the ROK to control escalation of the conflict on the Korean Peninsula. Without early warning capabilities, such a decision could be based on a false-positive alarm, human error or misdirection.

C. DPRK Leadership Crisis

Chairman Kim Jong Un's media absence for 20 days in April 2020 triggered widely-circulated rumours regarding his health. Even this relatively short-term absence of the DPRK leader from the public eye aroused uncertainty regarding the country's future, leading to media frenzy around the globe. States such as the ROK, China and Russia all worked individually to dispel growing media rumours and there was no appearance of internal or external pressure to take advantage of the situation.

The DPRK's system of nuclear weapon command and control still remains opaque to outside observers. One relatively credible assumption could be that the ultimate power to launch a nuclear strike lies with the Supreme Leader. If, at



The Kumsusan Palace of the Sun serves as the last resting place for Kim Il Sung and Kim Jong Il, both posthumously declared as "Eternal Leaders of Juche Korea," 16 February 2020. Credit: KCNA

some point, there were no clear leader (or a small decision-making group acting in such a capacity), the command and control system might be at risk.

Nuclear-weapon States such as China, Russia and the United States may seek to intervene in order to secure the nuclear weapons, technical information, production facilities and fissile material. This would be important not only to prevent their accidental or intentional misuse but also to ensure that they would not be proliferated to other countries. However, foreign intervention — even with the sole purpose of securing nuclear weapons and material — could be perceived by the DPRK as an invasion and an attempt at regime change and, thus, might entail retaliation. Such a development could escalate to an actual nuclear exchange.

There are three main triggers that could lead to the development of the above scenario — natural death of a leader, assassination by domestic forces as a result of a coup or assassination of a leader by a foreign actor. While very different in nature and immediate consequences, all three triggers have a potential to ultimately lead to nuclear risk.

1. Natural Death of Leader

Kim Jong Un's health became the subject of major speculation in the Spring of 2020 when he briefly disappeared from public events at the beginning of the coronavirus pandemic. Kim Jong Un has not publicly identified a successor,

though he is thought to have children. His sister, Kim Yo Jong, is First Vice Department Director of the Central Committee of the Workers' Party of Korea and is a plausible regent until his children come of age.

The two previous power transitions — from Kim Il Sung to Kim Jong Il, and from Kim Jong Il to Kim Jong Un — suggest that if the transition were made in accordance with a succession plan, escalation of conflict would be unlikely. Both leaders passed away at a considerable age and had prepared for their succession. In Kim Il Sung's case, Kim Jong Il had already been long involved in ruling and the transition was smooth. In Kim Jong Il's case, Kim Jong Un was also well on his way to fully taking over his father's position.¹⁷⁵

A future leader who is not well established may seek to burnish his or her military credentials. In 2012–2013, tension occurred shortly after Kim Jong Un took power, caused by Pyongyang's satellite launch attempts in April and December 2012, the latter of which sent the DPRK's first satellites into orbit, and by its third nuclear test on 12 February 2013. These actions were condemned by the UN Security Council as having violated the UN Security Council resolutions against the DPRK but were praised by State media as victoriously consolidating Kim Jong Un's position as the third-generation ruler of the DPRK.¹⁷⁶ Notably, Kim Jong Un has conducted many more nuclear and missile tests than his predecessors.

2. Coup d'État

Allegedly, there have been a small number of coup attempts targeting top DPRK leadership, though they are not possible to confirm with open source information.¹⁷⁷ A prominent example is reported to have occurred in 1995, when a group of high-ranking regional officials and the 6th Army Corps in Chongjin, North Hamgyong, were caught in their attempt to spark major unrest and possibly overthrow the leadership. Allegedly, more than 40 military officers were executed and another 400 purged.¹⁷⁸ These reports have been neither confirmed by the DPRK nor publicly verified by any other country, nor are they verifiable on the basis of open source information.

Similarly, there have been allegations that a massive explosion in 2004 at Ryongchon station, North Pyongan, was an assassination attempt targeting Kim Jong Il in his personal train returning from a visit to Beijing, though the timing of the explosion does not line up. While Kim Jong Il is cited to have personally believed it to be an assassination attempt¹⁷⁹ and KCNA confirmed that an accident had occurred,¹⁸⁰ the real nature of the incident remains an open question.

Among a number of factors and pre-conditions that need to be present for a coup or revolution to be successful, some of the most important ones are: (1) mass frustration among the general public leading to popular uprisings, (2) severe political crisis paralysing State administrative and coercive capabilities, making it impossible for the government to efficiently suppress protest, (3) a permissive or tolerant world context, (4) unifying motivation for protestors and (5) dissident elite political movements that could potentially guide protests from abroad without risk of detention.¹⁸¹

Very few, if any, of these criteria are currently met in the DPRK. However, these preconditions need to be continuously monitored for early signs of potential uprising. Moreover, an additional crucial criterion in the DPRK is control of the military. Whoever is in charge of the DPRK's military has the power to perform a successful coup even without the presence of all the aforementioned criteria.

It is also important to consider foreign attempts at destabilizing the DPRK regime. Attacks against DPRK embassies and personnel such as the one

by ROK and US citizens known as *Free Joseon* could also escalate to conflict, particularly if the DPRK believed that they were being materially supported by governments.

3. Foreign Assassination

A trigger with a high probability of escalating to a total war and an actual nuclear exchange is if a foreign State were to attempt to change the government and the regime. This could lead to broader instability on the peninsula and a high degree of uncertainty as to how the situation in a leaderless nuclear-armed State could unfold.

The United States has developed a military plan for regime change in the DPRK. After the DPRK reportedly hacked a series of ROK-US documents in 2016 by breaching a computer network of the ROK military, it became clear that a decapitation strike against the DPRK leadership was under consideration.¹⁸² Similar plans were developed by the United States against Soviet leadership during the Cold War; however, in response, the Soviet Union developed semi-automated nuclear launch systems. In effect, it backfired.

One of the ROK-US military strategies is reported to be *Operation Plan (OPLAN) 5015*, which describes rapid and aggressive actions that the two countries would undertake in response to a large-scale attack or another emergency requiring swift responses. It is believed that part of the planning includes a preemptive *decapitation strike*.¹⁸³

Under conservative President Lee Myong-bak, the ROK announced the test of an early Hyunmoo-3C cruise missile into a possible model of Kumsusan Palace just a few days prior to Kim Jong Un's regular visit to the actual palace as part of Day of the Sun celebratory events.¹⁸⁴ If the symbolism was not clear enough, the ROK Ministry of National Defense stated that it was a "weapon capable of accurately striking windows hundreds of kilometers away",¹⁸⁵ with the insinuation that the missile could strike the leadership in its key facilities.¹⁸⁶ Such declarations caused broad and strong reprisals from DPRK State media. The ROK's more advanced missile capabilities continue to signal an intention to keep a *decapitation strike* against DPRK leadership on the table.

D. Natural Disasters and Accidents

Under this scenario the triggering events are considered rare and unlikely, but consequential enough to warrant examination. Natural disasters and other unintentional events such as accidents are almost impossible to predict but, depending on their scale, they could lead to a broad domestic and regional instability which is a crucial factor when it comes to security matters.

From the broad range of possible disastrous events and accidents, ONN has singled out two major triggering developments that could lead to conflict escalation — an accident at a nuclear-related facility, such as the Yongbyon 5MWe nuclear reactor, and natural disasters, such as flooding, which could lead to major humanitarian issues and trigger social unrest. As discussed in the scenario of leadership crisis, domestic instability and widespread dissatisfaction and frustration among the general public have a potential to lead to protest movements and, in an unlikely scenario, to a subsequent coup. Such abrupt regime change might result in a “loose nuke” scenario (see Section III C. — DPRK Leadership Crisis).

1. Nuclear-related Accident

The 5MWe nuclear reactor at the Yongbyon Nuclear Scientific Research Centre is used as a source for plutonium production for the DPRK's nuclear weapon programme. The reactor was initially constructed in 1986 and, though it underwent reconstruction in 2013¹⁸⁷ (with satellite imagery it was possible to verify that a secondary cooling system was added), some experts point out its obsolete design and the difficulty to obtain spare parts and equipment for

its proper maintenance, which could potentially lead to accidents.¹⁸⁸

The reactor is situated on the bank of the Kuryong River, which is used for reactor cooling (see Figure 4 below). The DPRK has built a dam down river and conducted dredging works to ensure sufficient water levels. Any damage to the dam leading to an insufficient water level for reactor cooling could result in the reactor core overheating, a meltdown and potential uncontrolled radioactive release.

There are many other possibilities for reactor malfunction that could lead to radiation release. The possibility of accidental radiation release would be a major concern for all neighbouring countries.¹⁸⁹ According to the assessment of the Nautilus Institute, the amounts of released radioactive material (primarily radioactive isotope caesium-137) would not be sufficient to pose any serious threat to other countries but the accident would definitely have a major psychological effect.¹⁹⁰ If the DPRK could not deal with the accident promptly and efficiently and would not allow external help, external actors might decide to intervene in some fashion due to domestic pressure. Without the DPRK's explicit invitation, this would be seen as an invasion.

2. Humanitarian Crisis

Drought and flood have long been a seasonal threat in the DPRK, which disproportionately affect the agricultural sector and lead to food shortages. Large-scale deforestation also has a negative impact on the quality of soil and overall biodiversity and sustainability of ecosystems, which in turn encumbers farming.¹⁹¹ Domestic food shortages combined with the numerous

FIGURE 4. SATELLITE IMAGERY OF YONGBYON 5 MWE REACTOR AND DAM



Source: Google Earth, CNES/Airbus

international sanctions imposed on the country, which prevent the cross-border trade of goods, might lead to significant food security crises and even famine. The country has already experienced severe mass starvation in the 90s. A series of floods and droughts in the mid-90s coupled with a general economic crisis led to a major humanitarian catastrophe.¹⁹²

The most recent significant flooding happened in the summer of 2020 due to a heavy rain in the region. Hundreds of houses and large areas of agricultural land were affected. The scale of events was so large that Chairman Kim Jong Un paid a personal visit to areas of North Hwanghae Province most affected by the flooding.¹⁹³ Rain during the harvest season in the rice-growing area also raises concern about the DPRK's food security.

IV. ONN ACTION PLAN

ONN's goal is to convey accurate information, provide transparent processes and remain neutral to government influence. Committed to ethical practices in open source analysis and techniques, and as a pioneer in the field, ONN has created a *Code of Ethics*, which is posted on its website.¹⁹⁴

A. Analytical Work

ONN is a transparently cross-national, data-driven, civilian programme committed to creating opportunities to recognize and de-escalate crises before they develop. ONN's current analytical work is concentrated on possible scenarios for conflict escalation on the Korean Peninsula as described above.

In order to reduce nuclear risk on the Korean Peninsula, ONN's team of analysts produces data-driven insights to provide decision makers with unbiased, fact-based analyses. The results of the analytical work are conveyed to decision makers through ONN's Engagement Network members. All these actions combined are designed to reduce the risk of nuclear weapons being used in response to error, uncertainty or misdirection, particularly in the context of escalating conflict.

As part of its strategy, ONN's analysts closely monitor indicators of conflict during a crisis using ONN's custom-designed software platform Datayo. It allows ONN analysts and other Datayo users to fuse and visualize data in a single workspace and discuss/comment on what they see in real-time. Datayo also invites users to tag data to prepare them for use in machine-learning applications for arms control verification.

By monitoring a wide range of indicators that can signal an escalating crisis, ONN keeps abreast with relevant developments in the region. All its monitoring activities are based strictly on data from the open source domain.

Among the many methods for monitoring such indicators, ONN uses text analysis (such as topic modelling and sentiment analysis) in multiple languages, photo and video analysis, satellite imagery analysis and ship and flight tracking.

1. Monitoring Activities

For each scenario outlined in Section III above, ONN has identified preliminary indicators to monitor. The intensity of monitoring activities depends on the intensity of the crisis. When the regional situation is relatively stable, monitoring activities include a more general approach to monitoring. In the face of escalating conflict, monitoring will be intensified and targeted to specific languages, sites, activities or individuals relevant to the situation.

a. Limited Military Exchanges

ONN defines a military "redline" as a territorial boundary or other limit to military action which should not be crossed by an adversary. In order to pressure adversaries, leaders often do not expressly define a redline or the extent to which they are willing to retaliate if an adversary is perceived as crossing it. This policy tactic of "leaving something to the imagination" can pay off if adversaries correctly understand the redline and believe the consequences of crossing it to be too costly to be worth it. However, unspoken and undefined redlines can be very risky in conflict escalation. If the adversary either does not understand the redlines or incorrectly believes that there will be little or no retaliation, conflict can escalate suddenly and with dangerous results. On the other hand, leaders who either declare, or face a publicly declared, redline can feel compelled to escalate conflict or risk looking impotent to their own constituents.

i. Crossing United States' Redlines

The DPRK has regularly threatened US forces through government statements and State media. Generally speaking, these threats are perceived by the United States as having low credibility due to their flamboyance and frequency, with little or no action taken later. Nonetheless, the DPRK could follow through on its threats, surprising the United States and conducting a highly provocative "enveloping strike at Guam" as was explicitly threatened in the past.¹⁹⁵ It could launch a limited strike against US military bases, personnel or assets in the region, such as in an attempt to bring down a US reconnaissance aircraft or against US targets along the demilitarized zone. For these scenarios, ONN will mainly conduct text and imagery analysis to assess the risk of such high-intensity provocations.

ONN's source material includes the DPRK's State media, namely the State television channel KCTV, the State news agency KCNA and the Workers' Party newspaper *Rodong Sinmun*. ONN will look for keywords in Korean and English, such as "fire demonstration", "power demonstration", "envelop", "Hwasong", "artillery unit", "strategic force" and "rocket force" for indications of threats of artillery or missile salvos, in conjunction with other keywords, such as "US", "aggression", "invasion", "intruding", "airspace", "Juche army", "joint military exercise" or "sea of fire," in addition to numerous other key phrases, and also specific target names. In addition to its native-English and Korean language analysis, ONN is also able to make automated transcripts of KCTV footage in Korean, and set up alerts for any key phrases appearing in videos.

Similarly, ONN will monitor US presidential statements on government websites, in the media and on social media that may create or reiterate a US redline or demonstrate the intention to cross a DPRK redline. ONN will also monitor US military and joint forces, official websites and social media accounts, such as the 2nd Infantry Division (@2INFDIV), US Forces Korea (@USForcesKorea), US Eighth Army (@EighthArmyKorea), US Indo-Pacific Command (@INDOPACOM), US Pacific Airforces (@PACAF), US Guam Naval Base (@nbgum), US Pacific Fleet (@USPacificFleet) and the US 7th fleet (@US7thFleet) in addition to many others. These websites and official accounts, along with US media, might intentionally or unintentionally reveal information hinting at preparation for a perceived DPRK threat or a high-level provocation, such as the withdrawal of non-essential personnel and families.

Analysts will pay specific attention to where military assets are located, particularly in the context of the US Air Force's new approach of "operational unpredictability."¹⁹⁶ US reconnaissance assets' movement in the region, such as the RC-135 and E-8C reconnaissance aircraft that collect electronic and radio intelligence and take radar images of the ground, and US naval fleets can sometimes be tracked by flight trackers and ship trackers, which integrate registered flight and ship information around the globe as well as open source information noted by civilians. Social media accounts can also be helpful.

Known missile launch locations are monitored with satellite imagery taken with higher frequency. In the past, the Hwasong-12 intermediate-range ballistic missiles have been launched from civilian airfields near Pyongyang and areas near the DPRK coastline. With offroad trucks to carry them and a patch of land hard enough, the missile launchers can operate in many other areas as well. It is suspected that some Hwasong-12 missiles are deployed at the Sangnam-ni missile operating base located around 250 km north of the demilitarized zone. The Sil-li missile base near Pyongyang could also be a convenient venue for the DPRK supreme leadership to visit and observe a missile test or fire demonstration. However, the DPRK Strategic Rocket Forces are well aware of movements of overhead satellites and often maneuver during the night, which reduces the chance of spotting the movement of the missile launchers and supporting vehicles unless synthetic-aperture radar is used, which is costly and can be infrequent. DPRK units are likely to leave the site quickly after launch, which makes post-launch monitoring more difficult.

By using commercial satellites alone, it is difficult to monitor movement of troops such as the ones that carried out the attack on Yeonpyeong Island in 2010. However, after the shelling, some commercial satellite images did show preparations such as digging artillery positions made by these artillery units prior to attack.¹⁹⁷ Thus, ONN will make all efforts to find relevant early warning signs. Information from overseas media with sources inside the DPRK will not be neglected, though such information is often unreliable.

The DPRK is dotted with empty surface-to-air missile launch positions. During times of tension, ONN monitors the status of these sites to see if the military has elevated its alertness levels. Also, it is important to keep seasonal characteristics in mind. For example, as autumn is harvesting season, there are typically fewer major military drills and missile launches. ONN pays extra attention to see if the DPRK is stepping up military preparation and alertness during this time of the year to spot signs of possible anomalies.

ii. Crossing DPRK's Redlines

As described in the previous section, a US *bloody nose strike* — a joint exercise or a show of force that is perceived by the DPRK as a pending invasion, or even an accident happening during one of these exercises — could be perceived by the DPRK as the crossing a redline. Though the United States may be willing to risk a limited conventional attack, US decision makers may not expect a nuclear retaliation. ONN monitoring focuses on tracking relevant military activities, both as they relate to the exercises and as possible heightened alert posturing.

To monitor military activities in the region and official stances of the governments, ONN will track the same indicators mentioned above with regard to US redlines. For example, bellicose US rhetoric, as reflected in the infamous “fire and fury” speech of President Trump, and responses from the DPRK, such as Chairman Kim Jong Un’s personal message to President Trump, and the United States emphasizing its military presence in the region are important indicators to look for. An indication of when the United States anticipates a high risk of military exchange demanding evacuation measures is also when it decides to withdraw non-essential personnel as reported by media outlets or even in social media accounts of personnel and their relatives.

iii. Crossing Inter-Korean Redlines

The crossing of the two countries’ respective redlines may occur at sea, on land or in airspace. Either country may deliberately decide to conduct a limited act of aggression under the possibly false belief that it can control further escalation. A redline may also be crossed as a result of an accident or misperception, for example during military exercises, which is then understood as requiring a military response. Military incidents that could have escalated further have frequently occurred in the contested areas in the Yellow (or West) Sea and along the Military Demarcation Line. As such, ONN pays particular attention to any announced military activities that are reported to be within those areas and are anomalous as compared with past activities. The September 2018 *Comprehensive Military Agreement* provides us with the most recent indication of what geographical locations and border region activities the two Koreas consider as sensitive and warranting countermeasures.

While the DPRK has since put the validity of the agreement into question,¹⁹⁸ it is reasonable to assume that any military or civilian activity within the designated buffer zones poses a significant risk of escalation (see Figure 2 above).

During non-crisis times, ONN conducts a constant assessment of the state of inter-Korean relations, e.g. by assessing the number of official interactions, tracking government officials with clear signaling intentions vis-à-vis their counterparts and observing progress in inter-Korean cooperation projects, such as natural disaster response cooperation in the border region, construction of railways, small-scale trading and humanitarian projects and resumption of tourism or family reunions.

During heightened tension, ONN also tracks anomalous military movements, such as additional fortifications at artillery installations in the border region and increased patrolling by the two countries’ navies, with GIS ship tracking and satellite imagery of ports. In addition, ONN looks out for official changes in the alert status of border troops as indicators of an impending crisis. Because such movements and alerts are usually not publicly disclosed and hard to monitor for external actors, analysts will monitor for any indication that heightened civilian protection or evacuation measures, especially in border regions, are implemented. An increased number of reported meetings by the ROK Blue House’s National Security Office and its Crisis Management Center is also a good indication for times when the ROK Government is closely monitoring developments of concern.

Official military readiness levels¹⁹⁹, such as DEFCON (Defense Readiness Condition), WATCHCON (Watch Condition), INFOCON (Information Operations Condition) and “Jindo Dog” (readiness posture levels) are also clear indications of heightened military posturing if made public. ONN is also conscious of how military exercises, whether just of the ROK or jointly with the US, at varying scales and localities can — despite their regularity and officially defensive nature — be perceived as war preparation and threats to territorial integrity. As such, ONN tracks historical and current military exercises including the time, frequency, scope, size, topic and location of each exercise in order to compare them with their past iterations and respective reactions by the other party.

b. Major Changes in Military Balance

i. Nuclear and Missile Testing

Tunnelling and renovation of facilities at the Punggye-ri nuclear test site or other locations can be indicators of preparations for underground nuclear testing. Tunnelling is difficult and time consuming and quite noticeable with commercial satellite imagery. High resolution imagery can detect large piles of spoil (dirt extracted from the mountain), mining carts and construction material produced at the on-site sawmill from nearby lumber. In addition, the site maintains its own armory, greenhouse and barracks all of which show signatures of when the facility is being maintained versus actively expanded or remodeled.

The most provocative kind of nuclear testing is atmospheric testing. As the DPRK's territory is relatively mountainous with many populated areas, there is no ideal location to conduct such testing without high fallout risk to the DPRK's own territory and that of the neighbouring countries. While it is unlikely that the DPRK would conduct an atmospheric test from a tower, such towers are easy and quick to construct, and difficult to detect with satellite imagery. Should the DPRK instead choose to conduct an atmospheric test by live detonation of a nuclear warhead on an intermediate or intercontinental ballistic missile over the Pacific Ocean, ONN would hope to see advance notice of the test published broadly. Historically, the DPRK has not published notices ahead of missile or nuclear tests. However, a live nuclear explosion on a missile could easily be misunderstood by neighbours as an attack. It is unlikely that ONN could monitor for such a test otherwise.

After a suspected nuclear explosion, ONN will receive seismic readings from monitoring stations run by the Comprehensive Nuclear-Test-Ban Treaty Organization's (CTBTO's) International Monitoring System to conduct preliminary yield estimates based on the location and type of explosion. In the days following a suspected test, radionuclide data may be made available by the CTBTO and national governments which can reveal information about the nature of the nuclear explosion. Some signs of nuclear testing, such as seismic activity, shock waves and other physical signs of underground explosion, may also be spotted by local residents in border regions

of China and Russia. ONN will monitor relevant social media platforms, such as Weibo, Twitter, VK and YouTube for this kind of information.

ONN will also monitor information sources on atmospheric modelling to track the effects of weather on emissions from a nuclear test. These sources include the CTBTO, the Nuclear Safety and Security Commission and the Korea Institute of Nuclear Safety in South Korea, the Ministry of Ecology and Environment of China, the Russian Federal Service for Hydrometeorology and Environmental Monitoring (Roshydromet) and the US National Oceanic and Atmospheric Administration.

Should the US resume underground nuclear testing, ONN will monitor similar data from similar sources to measure the number, size and type of explosions.

ONN will monitor the Yongbyon Nuclear Scientific Research Centre for plutonium production and reprocessing, uranium enrichment and tritium production. Yongbyon's facilities are easily monitored for vehicle activity; however, certain parts of the nuclear fuel cycle — particularly enrichment and reprocessing — are difficult to monitor from a distance. Vehicle traffic, and other indicators of human presence, however, are continually available and ONN will monitor commercial sources for an indication of a change at the site. With regard to the 5MW reactor and the light water reactor, some of the cooling activities and fuel ponds offer indicators of whether the reactors are in use and how frequently the 5MW reactor is reloaded. The melting of snow on the rooftops of heated buildings and discharge of warm water into rivers are indicators that some kind of activity is ongoing. It is challenging, however, to make an effective quantitative estimate of the volume of the nuclear material produced.

In addition to the known facilities at Yongbyon, ONN will monitor possible uranium enrichment sites, including one near Kangson. ONN will also attempt to identify additional undeclared uranium enrichment, fuel fabrication and warhead storage sites.

Monitoring missile activities is not unlike monitoring nuclear activities. Missile launch facilities need to be monitored with remote sensing data. In addition, missile production

facilities, including those for liquid-fuel engine development and solid-fuel motor development and their testing facilities need to be included. Thus, the North Korean Sohae Satellite Launching Station and the Tonghae Satellite Launching Ground, horizontal test stands, the Chemical Material Institute in Hamhung and vertical test stands near Pyongyang need to be monitored as well as other sites.

While it is rare for an ongoing engine test to be caught by a satellite, burn marks left by liquid fuel engine or solid fuel motor exhaust around the test stand can sometimes be identified, proving that such tests have taken place. Associated items, such as propellant tanks and their trailer trucks, could also be spotted by commercial satellites.²⁰⁰

Apart from liquid-fuel ballistic missiles, the DPRK is also developing solid-fuel ones. Monitoring solid-fuel missile production and movement on land is not different from monitoring liquid-fuel missile production and movement, except that their signature can be smaller as it is possible that liquid-fuel missiles will travel their propellant tanker trucks in a convoy.

ONN will also monitor the DPRK's SLBM submarine development base (the Sinpo South Shipyard), where a submarine is being built and SLBM ejections tests are occasionally conducted on land west of the facility or from a submersible platform off the coast.

Prior to a nuclear test or a satellite/long-range missile launch, the DPRK's State media may also publish articles to justify activities and inform their audience in advance. Thus, official media outlets and some Japan-based DPRK-friendly media, such as *Choson Sinbo*, will be followed closely to look for any announcements of an impending satellite launch or major weapon test. Quoting the intelligence community or government insiders from Japan, the ROK or the United States, news media may also leak intelligence or assessment on an upcoming satellite launch or major weapon test.

The status of international, bilateral and unilateral arrangements (for example, the DPRK's termination of its moratorium on weapon testing) and meetings between relevant States will also be observed, in particular those between the DPRK and the United States, as there could

be, for example, an abrupt discontinuation of working level talks in relation to an upcoming nuclear-weapon-related testing activity.

ONN will monitor strategic weapon and ballistic missile defence development in the United States that could possibly trigger a regional response. US strategic weapon testing activities and deployment such as hypersonic weapon programmes and land-based intermediate-range missile development and its deployment in the Asia-Pacific region can be monitored through US media, debate in US legislative bodies, official websites and social media accounts of weapon developers and military units (such as Boeing, Lockheed Martin, Defense Advanced Research Projects Agency, US intercontinental missile bases, US strategic bomber wings).

ii. United States' Troop Withdrawal

Clear indications of an impending presidential directive to withdraw or significantly reduce troops in the ROK would be a request for certification by the US Secretary of Defense on the provisions outlined in the 2020 *US National Defense Authorization Act* (NDAA) described above. Unless there is a fundamental change in the security environment, such a request would likely follow a long and public debate, if not strong opposition, from the US public and also from the ROK and Japan, who may not agree with an assessment that the stipulated conditions in the NDAA are met.

Following reports that a request has been made to the US Secretary of Defense, ONN will closely monitor congressional activities, statements by the US military leadership and known details from consultations with US allies for an assessment on what the strength of opposition is likely to be. Opposition strength and its willingness to exercise its authority to restrict funding on particular items is a key indicator of how feasible implementation of an announced withdrawal plan actually is. Conversely, wider congressional support for troop reduction or withdrawal is of similar importance as an indicator because it could facilitate withdrawal implementation by introducing changes to the restrictive parts within the NDAA.

Any changes to the *US-ROK Mutual Defense Treaty* or the United Nations Command may also serve as impetus for possible withdrawal.

Elimination or significant alteration to either would, by extension, automatically raise questions about possible reductions or a withdrawal by mutual agreement of the two countries. Any such fundamental changes would likely require developments such as a peace declaration or significant changes in the threat perception vis-à-vis the DPRK, a turn in South Korean public support for continued US presence and a more independently capable ROK military. ONN tracks relevant developments within these categories of fundamental changes with particular attention to public opinion and the state of progress in operational control transfer and associated ROK modernization planning.

iii. Redeployment of United States' Nuclear Weapons

Monitoring developments that could suggest a move to redeploy nuclear weapons to the ROK or Japan would be similar to monitoring for troop withdrawal. Primary indicators include official statements, bilateral deliberations and public opinion and legislative changes in the prospective hosting country, the United States and between the two in the form of a sharing arrangement akin to what is in place between the United States and NATO States. It is possible that prior to actual deployment, the United States and its allies would first increase the role of strategic nuclear weapons in the mutual defence relationship by increasing rotational deployments via SSBN port visits and dual-capable aircraft to allied air bases. ONN would monitor for any reporting indicating an increase in rotational deployment of such strategic assets.

If a permanent redeployment decision is made public, the ROK would also be under pressure to publicly declare its shift away from the decades-long official goal to achieve a nuclear free peninsula as stipulated in the 1992 *Joint Declaration of the Denuclearization of the Korean Peninsula*. Under the declaration, the ROK committed to also “not test, manufacture, produce, receive, possess, store, deploy or use nuclear weapons.”²⁰¹

Clear indicators following a redeployment decision would be the move or construction of nuclear-weapon-related infrastructure (e.g. storage vaults, additional security perimeters, custodial units) in the respective countries, such as at Kunsan or Osan Air Base in the ROK. ONN

would also look for any indications suggesting a move of arsenal away from Europe to Asia since this is where forward deployed tactical nuclear weapons would most likely come from, given their ready availability. In the event of such developments, ONN would conduct satellite imagery analysis to verify reports and to attempt to get a sense of the size and type of arsenal and possible delivery vehicle deployed.

Redeployment would also be accompanied by the establishment and possible announcement of a nuclear consultative group similar to NATO's Nuclear Planning Group to discuss policy and operational planning. It is also likely that necessary nuclear policy changes would be reflected in doctrinal documents such as the *US Nuclear Posture Review*.

iv. Conventional Military Buildup in ROK

Indicators to monitor the pursuit of more advanced conventional capabilities by the ROK include changes in yearly budgetary plans, yearly Defense Mid-Term Reviews for the following five years and biennial Defense White Papers, all of which may provide indications of investment priorities in both acquisition and indigenous R&D planning. Ministerial reports to the National Assembly, major Blue House National Security Council defence speeches and announcements and presidential plans usually revealed at the beginning of a presidential term, such as President Moon Jae-in's 2017 Defense Reform 2.0, are similarly important to track for a better understanding of policy priorities.

More difficult assessments include monitoring activities by the ROK's Agency for Defense Development, the primary institute responsible for domestic weapons and defence technology R&D. Missile test fires, for example, tend to come with a corresponding navigational warning that can give analysts an indication of the range for which a particular missile is designed. Known launch sites under the agency, such as the Anheung Proving Ground, can be analysed for activity with help of satellite imagery. Integration and deployment of successfully tested technology may then also be reflected in changes to or novel military drills and exercises. If public knowledge of newly acquired or developed weaponry is desired, the Ministry of National Defense or the ROK Blue House may also publish video and briefing material of visits

by officials or test recordings that can give ONN analysts further data points with which they can assess and verify reported developments.

v. Pursuit of Offensive Capabilities by Japan

If the Japanese government decides to pursue capabilities that are unambiguously offensive in nature and purpose, it would involve a broad public debate domestically, and possibly require legislative changes, and consultation with Japan's ally, the United States. These factors would be the most important indicators to monitor and would certainly be announced by the Japanese government and debated within the parliament, which will attract a lot of media attention. To monitor these, ONN will look into elections, official government statements and press releases, media reports and social media discussions on these topics, and consult with ONN intermediaries and experts.

Another important indicator will be changes in Japan-US defence arrangements. The current Japan-US military alliance is guided by the 1960 *Treaty of Mutual Cooperation and Security* and the subsequently concluded framework of additional agreements, as discussed in previous sections. ONN will be monitoring the status and, if any, amendments to the relevant agreements to look for any indicators of a shift in policy. At a later stage of the decision-making process, weapon acquisitions (e.g. as reflected in trade data²⁰²) and changes in military exercises (monitored through official announcements, media and satellite imagery) could serve as additional indicators.

c. DPRK Leadership Crisis

i. Natural Death of Leader

ONN is keeping an eye out for any indications that the DPRK leader has serious health complications through analysis of visual material released by State media. Through analysing satellite imagery, ONN will also be tracking unusual activities around specific hospitals capable of the type and quality of care for the DPRK leader and potential Chinese or other hospital staff that could be called upon by the DPRK to treat the leader in the event of a health crisis. At any given hospital, increased security measures and additional presence of security personnel could signal the presence of a high-profile figure inside the facility. Anomalous charter flights between the

DPRK, China and Cambodia could also indicate the arrival of additional medical personnel to treat the leader.

Additionally, ONN is tracking the general media presence of top leadership. For example, how frequently are leaders present at major events and celebrations? Are there any anomalies in the attendance due to the frequency or magnitude of the occasion? Are there any unusual extended periods of media absence? Furthermore, any changes in organisational matters, as reflected in official announcements and State media or the promotion of any of the leader's relatives to high positions within the government could signal the preparation of a succession plan.

To monitor these indicators, ONN will (1) keep in contact with relevant medical specialists that have insights into the DPRK's healthcare system, (2) maintain an updated database of relevant individuals who could be potential successors to the leader and (3) continuously observe State (KCNA, KCTV, *Rodong Sinmun*) and social media reports and satellite imagery of DPRK hospitals (e.g. Hyangsan Hospital, Kim Man Yoo Hospital, Korean Red Cross General Hospital, Bonghwa Clinic). In the event of an unexpected death, (4) additional monitoring of internal military movements and other unusual military activities will be performed.

ii. Coup d'État

The main indicator to monitor for a potential coup, following which a leader could be killed or overwhelmed by a challenger, is leadership stability. An assessment of stability would encompass analysis of the country's economic situation, social unrest and foreign-supported challengers. Attention should also be given to potential groups or individuals that grow in influence within the DPRK and any foreign attempts at destabilizing the DPRK regime (e.g. groups such as Free Joseon).

As all of these indicators are extremely difficult to assess, ONN would concentrate its efforts on monitoring activities that are feasible with open source analysis, namely by (1) monitoring reporting on highly positioned individuals from within the leader's close circle (attending official events in the leader's presence, military visits, informal trips) by performing image and video analysis on material released by the DPRK's State

media (KCNA, KCTV, *Rodong Sinmun*); (2) keeping a database on these individuals and tracking changes in their career paths (e.g. promotions, demotions, new titles, State awards); and (3) keeping an updated compilation of publicly available information on neighbouring countries' planned response to regime change in the DPRK (e.g. OPLAN 5029).

iii. Foreign Assassination

Arguably, if any foreign State decides to assassinate the DPRK's leader, it would be a covert and highly secretive operation. The only reliable information sources to monitor for open source analysts are official statements from relevant countries that would follow such an incident.

Though this is a highly unlikely scenario and very little is known about any countries' planning on the issue (reported decapitation strikes in US-ROK planning are discussed in the previous section), ONN continuously monitors risks of a significant deterioration in the relationship between relevant countries, and leaks or announcements on decapitation planning from relevant countries. ONN will also monitor North Korean media and official statements for indications that they attribute the death to a foreign power and may seek to retaliate.

d. Natural Disasters and Accidents

i. Nuclear-Related Accident

In the event of an accident at a nuclear-related facility with a subsequent release of significant levels of radioactivity, the main indicator will be an official statement on the incident. It may come from the country itself, neighbouring countries or in form of official announcement from the CTBTO if its International Monitoring System's radionuclide stations detect radioactive isotopes. In addition to monitoring media reports and announcements, ONN would also monitor findings on radionuclide release from the countries' publicly available monitoring reports, such as press releases from the ROK's Nuclear Safety and Security Commission and the Korea Institute of Nuclear Safety, the Ministry of Ecology and Environment of People's Republic of China and the Russian Federal Service for Hydrometeorology and Environmental Monitoring (Roshydromet).

ii. Humanitarian Crisis

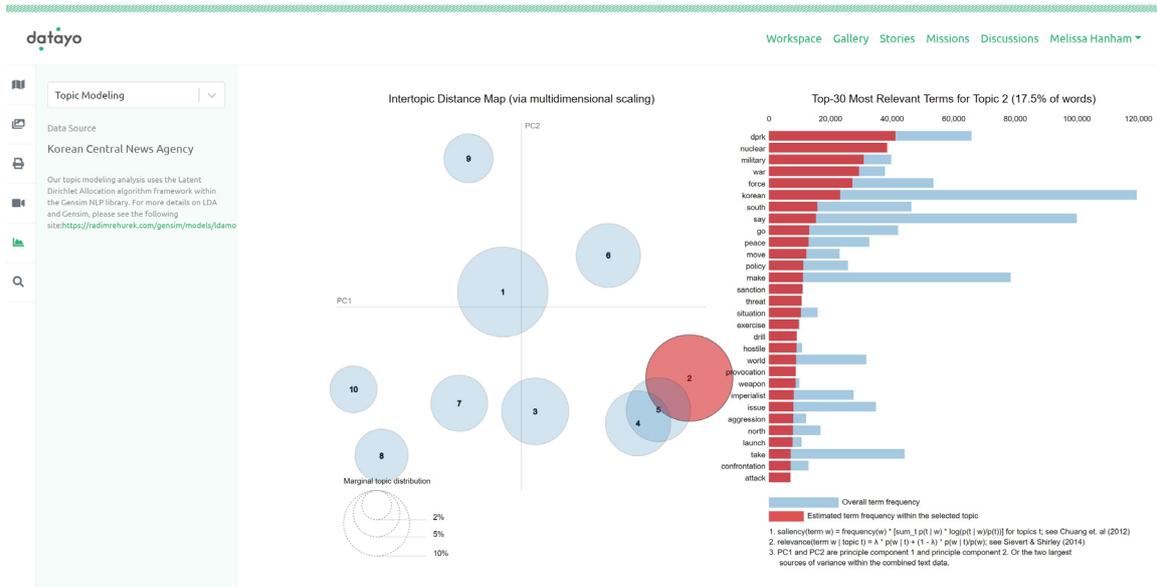
This trigger is tightly interlinked with the food security of the DPRK and resultant potential public uprisings as described in Section III. ONN would monitor any natural disasters and incidents that could affect the agricultural sector and thus lead to food shortages. Among the most common are such natural disasters as floods, droughts, typhoons and wildfires. Due to geographic proximity and similar climate zones, weather forecasting assessments and relevant measurements conducted by ROK forecasting agencies would be applicable to the DPRK and are actually also produced for the DPRK specifically (e.g. from the Korea Meteorological Administration). In addition to monitoring official forecasting and statistical data, ONN would also process and analyse satellite imagery of affected areas in order to comparatively assess the scale of the incident. Among other indicators for monitoring, ONN will be tracking customs data (to assess the amounts of imported goods to make up for food shortages), numbers of defectors/refugees fleeing the DPRK (this could serve as an indicator of the severity of a crisis), market prices for food products (primarily rice) and official government requests for humanitarian assistance.

2. Methodology

ONN can use a wide range of analytical methods to monitor indicators of possible escalation — including analysis of satellite images, photos/videos and text — among other open source investigative methods.

To enable efficiency, leverage outside opinions and provide ease of analysis, ONN has built a world class software platform known as Datayo.²⁰³ Datayo has three major benefits for ONN. First, it can fuse disparate datasets such as text, images, videos, and geographic data in one place (see Figure 5 below). This eases the data collection and cleaning burden for analysts and also allows them to identify insights that might otherwise be obscured in siloed datasets. Second, ONN's analysts can communicate and problem solve with outside experts and hobbyists in real time. While ONN used a global search to hire some of the most innovative and talented analysts in the world, access to crowdsourcing opportunities on Datayo means they can access rare or local expertise that may not otherwise be available in house, and they augment their capabilities

FIGURE 5. SCREENSHOT OF DATAYO WORKSPACE



by leveraging hundreds of workers to complete a task rapidly. These workers join ONN's Datayo software platform because of the access to exotic and expensive data and their desire to do social good by supporting ONN's mission. Third, Datayo's ingestion and storage of large datasets allows ONN analysts to craft training datasets, make derivative data products and train new machine learning algorithms that will cumulatively make their monitoring and analysis work more efficient and accurate.

Analysts at ONN are native speakers of Chinese, English, Japanese, Korean and Russian. Using their local knowledge, they have access to a more diverse set of source material and are also able to interpret nuanced intentions that can be lost due to translation. In addition to this qualitative analysis, ONN sets up trackers of sentiment to quantitatively monitor changes through Datayo.

ONN also monitors key military sites in the region, including missile bases, previous launch locations, ports, airfields and submarine bases as well as nuclear fuel cycle related facilities. Indicators such as movement of regional military assets, including intelligence gathering aircrafts, strategic bombers and fleet, will also be monitored through constant examination of satellite imagery, news outlets, social media and open source tools such as shipping and flight trackers.

a. Multilingual Monitoring of Information

A critical strength of ONN analysts is that they are multilingual in their areas of expertise. Multilingual open source information is widely available to those who can find and interpret it. For example, the suspected Russian nuclear-powered cruise missile accident came to light after open source analysts extracted information from social media to identify unusual anti-radiation and medical staff activities coming from a suspected testing area.²⁰⁴

Every ONN analyst is fluent in at least two languages and possesses technical knowledge related to the nuclear fuel cycle, missile development and military tactics. Collectively, they speak not only the languages of all countries in the Six Party Talks but other languages, as well. The analysts have specific knowledge about their respective home countries, culture and media landscape. This enables ONN to identify what is vital and accurate information, and what is exaggerated information circulated in non-mother tongue media. More importantly, they can pick up significant information that may be missed by such media.

b. Satellite Imagery Analysis

Commercial satellite imagery can be used to monitor activities on the ground to verify government claims, media reports and social

media assertions of weapon production and testing, as well as military activities. It can also be used to identify economic activities and verify treaties and agreements.

The primary commercial sensors used by ONN analysts are space-based electro-optical sensors that are able to detect objects of approximately 30 cm diameter or greater. The frequency of overpass, spectral wavelengths of light and spatial resolution of commercial satellite imagery can vary, yielding much more information to civilians today than even to US and Soviet intelligence agencies during the Cold War. ONN's analysts can derive more information from satellite images by false-colouring light wavelengths to help identify objects, material or even radio emissions that would not be visible to the human eye.

Synthetic-aperture radar, which uses radar instead of the sun's light, enables monitoring of activities at night or under cloud, and offers a limited ability to see through some material, such as fiberglass roofs.²⁰⁵ If an interferometric approach is taken, multiple synthetic-aperture radar images can be interpreted to show earth subsidence after an underground nuclear test by producing *interferograms*, which can show ground surface displacement over time.²⁰⁶ Synthetic-aperture radar is also excellent for monitoring traffic activity along dirt or sand roads and vessels at sea.

Machine learning augments traditional imagery interpretation by triaging the work of human interpreters with object detection and change detection algorithms in order to lighten their workload and improve the efficiency of what they examine. These nascent techniques allow analysts to monitor multiple locations with alerts and generally triage the number of images they have to visually inspect.

By way of example, on 16 June 2020, in a highly symbolic move, the DPRK demolished the Inter-Korean Liaison Office in Kaesong. ONN's analysts compared the satellite image and press photos. Using the pyramid structure in both images as reference, the analysts were able to confirm from which direction the photo was taken, and verify that only the liaison office was taken down and that the higher building, called the Central Support Center, in the same compound, remained largely intact.

c. Ground Photo/Video Analysis

Photo and video analysis can be used for a wide range of tasks. Foremost, it can be used to check if the image or video has been altered or faked in some way. Additionally, mensuration (geometric measurement) techniques can also be used to identify the size of objects in images or video frames, or even the speed of an object depicted in a video. Rocket launch videos can provide valuable information on the acceleration of the rocket. With mensuration of the object and estimated weight of each stage, analysts can determine the thrust of a rocket using classic Newtonian physics: $F=ma$. This in turn can be used to make range and payload estimates.

Combining satellite imagery to geolocate/identify where the picture or video was taken is another common technique.

d. Text Analysis

Text analysis is an automated process to extract information, relationships, patterns and meaning from large volumes of textual data. Data can be obtained, for example, from open source news, speeches and political documents.

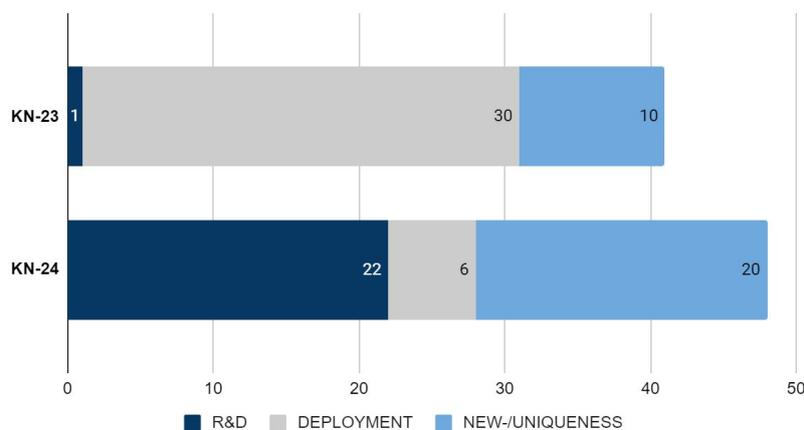
The goal is not to analyse or understand the entirety of a particular corpus, but to identify similarities and differences across many texts or to identify particular phrases, names or places. For example, analysts can use libraries of common names to identify people in text and check them against sanction lists. Networks between these names can be identified to reveal obvious or less obvious relationships between them.

Further analysis can include topic modelling or semantic analysis. While these are best done with large corpora, analysts usually have to make do with a small volume of available texts. ONN analysts have previously studied news articles from the KCNA and related them to the latest missile developments in the DPRK (see Figure 6 below).²⁰⁷

By combining all the above-mentioned analytical methodologies, ONN can choose and monitor indicators of potential armed conflict and escalation. For example, marine and air traffic datasets can help identify regional hotspots for potential conflicts. Monitoring social media and studying satellite images can help to provide

FIGURE 6. TOPIC FREQUENCY ON KEY WORDS USED BY KCNA'S REPORTING ON MISSILE TESTING ACTIVITIES.

Topic frequency is a useful tool for text analysis.



Tianran Xu and Jaewoo Shin, *A Tale of Two Missiles: Analysis of KCNA Reports on North Korea's KN-23 and KN-24 Short-Range Ballistic Missiles*, 23 April 2020, [Datayo.org](https://datayo.org)

leads for unusual troop and civilian movement, such as a sudden withdrawal of US non-essential personnel from the ROK.

Engagement Network

ONN's Engagement Network members are third-party experts recruited on the basis of their willingness to contribute and work jointly towards conflict de-escalation while serving as trusted intermediaries among the six countries. ONN provides them with regular briefings and bespoke analytical products using the tools described above.

As part of ONN's mission to facilitate dialogue and communication between relevant countries on nuclear risk reduction, the Engagement Network helps set analytical priorities based on their unique knowledge and experience in the region. Additionally, members advise ONN on opportunities to intervene in conflict before it escalates to the point of nuclear use.

Network members are also asked to serve as a direct channel between ONN and their respective country's governments to increase the policy impact of ONN's analytical products. As ONN's work is based entirely on publicly available information, such products are freely sharable and can serve as a suitable conversation item and agenda setter for dialogue with and between governments.

ONN members regularly meet bilaterally with ONN and occasionally in groups to prepare

strategies for times of conflict. In times of extreme risk, ONN will provide financial and logistical support to members for the purpose of de-escalation of conflict.

1. Members

The Engagement Network is a team of trusted leaders who create opportunities to de-escalate nuclear crises through open source information exchange and dialogue. ONN selects individuals who have a high level of diplomatic, military or technical experience in their respective countries and continue to have influence in places of conflict. In our inaugural year, participants of the Engagement Network are invited from China, the DPRK, Japan, the ROK, Russia and the United States.

These trusted leaders have demonstrated their knowledge and skill regarding the conflict on the Korean Peninsula and are willing to engage actively on a personal basis to co-develop strategies with ONN to prevent or interrupt potential conflict before it reaches the level of nuclear use. They have often served in decision-making roles in their own countries and are willing to engage other members to design cooperative strategies to de-escalate conflict and build trust. They are willing to vet and represent their approaches in bilateral engagements with their own governments or in multilateral fora. In addition, ONN invites members with varied carriers in politics, military, academia and technology in order to create strategies that take all factors into account.

ONN seeks to set up the Network for success by inviting members from the six countries most directly involved in the Korean Peninsula conflict: China, the DPRK, Japan, the ROK, Russia and the United States. Just as is the case with ONN analysts, Engagement Network members are prized for their local knowledge. ONN favours strategies for conflict de-escalation that are designed within the region rather than imposed from abroad using power or money. Like its parent foundation One Earth Future, ONN backs an approach of networked coordination, where diverse stakeholders engage in collaborative efforts because they share an understanding that the results will be individually and collectively beneficial over the long run. When it comes to solving the complex problem of creating sustainable and lasting peace, typical organisations are overly reliant on hierarchical and market-based forms of incentivization. A major challenge of networked coordination is that it lacks a formal way to enforce collective decisions. To help overcome this challenge, each of One Earth Future's programmes, including ONN, acts as a dynamic, third-party facilitator, actively sharing information, deconflicting and mediating stakeholder interests.

The Network is designed to represent multiple, sometimes challenging perspectives so as to ensure its relevance even in the face of changing domestic politics and leadership. While Network members may not always agree, they are individuals who have proven they can work within and across political and national boundaries to create strong alliances that can withstand times of conflict. In many ways this Network is designed to provide continuity in times when official diplomatic channels have already failed. They engage on a continuous track 1.5 basis to provide stability and knowledge exchange in times when official communications are at an impasse and the risk of accident, uncertainty or misdirection could lead to nuclear use.

2. Interface with ONN

ONN supports the Engagement Network through three types of resources. First, ONN analysts provide regular and bespoke briefings to members using sources in Chinese, English, Japanese, Korean and Russian. These briefings include, but are not limited to, regular monitoring assessments of the six parties to the

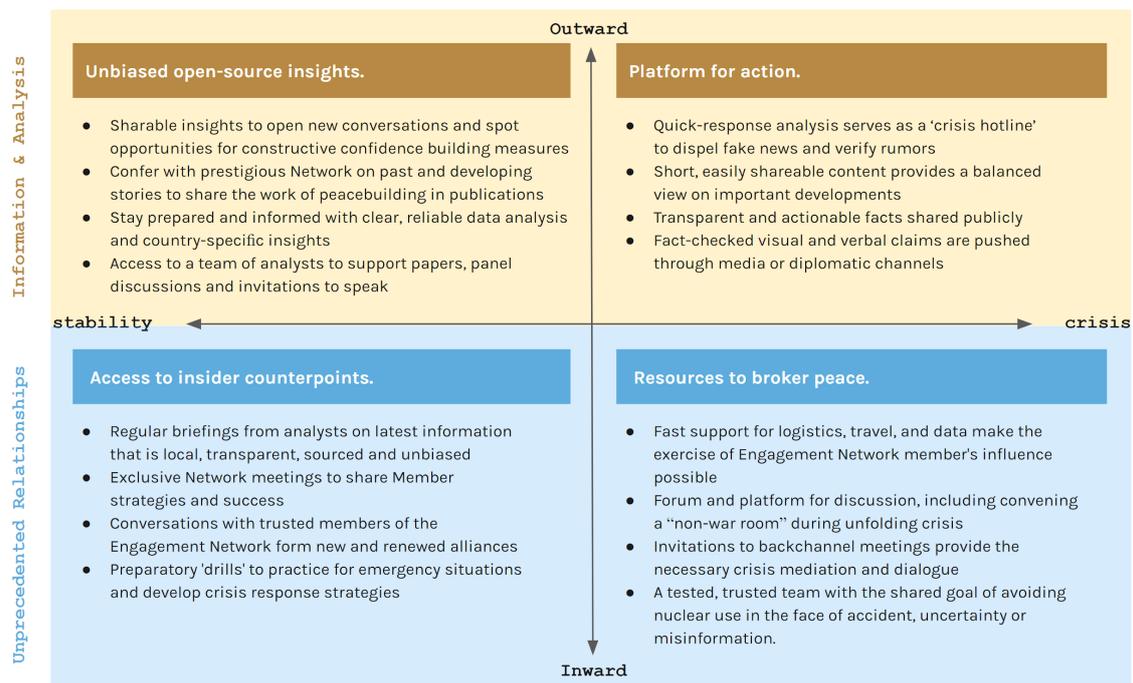
conflict that are available on ONN's Datayo.org website. These short briefings outline each of the six's arms control and nuclear risk reduction agreements, the latest information on nuclear and military doctrines, military alliances to which they are party and regularly updated information on their nuclear/military capabilities. To the extent possible, ONN reports on what is known about the command and control decision making around nuclear use.

ONN also provides its own bespoke research in order to fact-check rumours and media reports, track nuclear and conventional weapon development, analyse military and policy shifts and personnel reshuffles and update members on developing situations such as rising regional tensions or breaking news incidents. At a member's request, ONN can produce tailored briefings to facilitate the member's work in nuclear risk reduction. This can include background research and fact-checking in multiple languages, and preparing visuals such as satellite imagery, data graphs and infographics for the member's opinion pieces, presentations, articles, books or reports relevant to nuclear risk reduction.

In times of elevated risk of crisis, the analytical products will be concise and delivered rapidly to provide the most updated insights frequently. For more in-depth and research focused reports, the delivery date will be set after consulting with the Engagement Network members who requested the research.

ONN also serves as a venue for members to have direct and regular access to their peers in the region in order to share their collective wisdom, formulate new strategies and build trust. The role of ONN's Engagement Network Manager is to facilitate regular bilateral calls between the member and ONN. Typically, ONN will seek a monthly call with each member in order to: (1) understand the member's perceptions of the conflict risk; (2) conduct customized research at the request of the member; and (3) identify opportunities for the member to collaborate with other peers and external dignitaries in an activity to de-escalate conflict. To understand their preferences, the Engagement Network Manager will distribute a preference sheet to each member in order to determine the method and frequency of desired contact and to ascertain

FIGURE 7. POSSIBLE ENGAGEMENT NETWORK ACTIVITIES



if they are willing to share contact information with other Network members for the purpose of collaboration.

ONN's Engagement Network Manager will also plan an annual off-the-record workshop in Asia or Europe that will focus on the latest information on the Korean Peninsula conflict, team building between the members and training activities to prepare for times of elevated risk. To the extent possible, ONN will use virtual platforms recognizing that they are no substitute for in-person gatherings.

3. Activities

In times of relative stability, the outward facing activities of the Engagement Network will include providing advice on ONN's analytical briefings to the public and receiving analytical support for their own public nuclear risk reduction work. Meetings with the Network will focus on building trust and transparency among the parties to the conflict. ONN can provide research and briefings to support them at events where they speak about what can be done to reduce nuclear risk. Other more traditional activities include research support for writing op-eds or giving media interviews, publishing briefs on ONN websites and speaking at events that contribute to peace and security.

For inward-facing activities, members may request and receive individually tailored ONN briefings and other types of analytical products. ONN hopes that the members will share these analytical products with decision makers in their own governments in support of de-escalation and transparency. ONN can provide briefings via monthly individual check-in by phone, and in small group meetings on the sidelines of major events, or at ONN's annual off-the-record convenings for ease of sharing ideas. These may relate to or facilitate communication between Engagement Network members or between governments of their respective countries. ONN may also help Engagement Network members to convey their message to decision makers and vice versa. Members may also be asked to share their insights and expertise with ONN for analytical products, and to participate in crisis simulation exercises and war game activities during non-crisis times in order to prepare for future times of elevated risk.

Figure 7 above describes possible activities of the Engagement Network, both outward-facing and inward-facing, whether during times of stability or crisis.

Should ONN detect a conflict escalation, ONN analysts will immediately provide frequent updated rapid-response briefings to the

Engagement Network and the public. During this time, ONN will depend on the Engagement Network for a high level of involvement to disseminate as much factual information as possible and to spot opportunities to de-escalate the conflict and reduce the risk of accident, misunderstanding or misdirection. Depending on the severity of the crisis, ONN's analytical team will break into shifts and provide near constant availability to the Engagement Network. ONN will be in direct contact with the Engagement Network in order to provide open source shareable information that can be backchannelled to government decision makers in order to avoid an accident or misunderstanding that could escalate the conflict to nuclear use.

ONN may also provide financial and logistical support to Engagement Network members interested in convening an emergency meeting with high level decision makers to de-escalate conflict. At such a time, ONN analysts would be continually available on location to provide up-to-date, open source shareable information that can be used as a basis for mutual understanding in order to prevent nuclear exchange in response to error, uncertainty or misdirection.

V. CONCLUSION

Open Nuclear Network is committed to reducing the risk of nuclear weapon use in response to error, uncertainty or misdirection via the two-pronged approach of creating transparent sharable open source analytical products and placing them in the hands of savvy Engagement Network members for coordinated dissemination to decision makers. ONN's primary focus in its first years — and that of this paper — is on the Korean Peninsula.

This paper outlines the evolving positions and commitments of the six major stakeholder countries in the Korean Peninsula conflict: China, the DPRK, Japan, the ROK, Russia and the United States. It provides a background and a basis for understanding the complexity of the current conflict and how a trigger, even one that is perceived as minor, can lead to an escalation of conflict. The escalation scenarios section — by examining triggers and pathways that lead to conflict — demonstrates how intentional or accidental incidents, or even natural death or disaster, may inflame a simmering distrust into a full-blown conflict that could involve the use of nuclear weapons. Thus, the paper enables members of the Engagement Network to orient themselves towards the nature of conflict and helps them to identify what activities may catalyse positive and negative evolution in a conflict.

With this context in mind, the paper outlines ONN's general strategy. First, ONN will regularly provide transparent, shareable information using sources only recently available to civilians, using cutting-edge technology to enable its diverse staff to act efficiently and effectively. ONN's analysts have identified preliminary indicators of triggers to conflict through techniques ranging from traditional media monitoring in five or more languages to advanced use of satellite image processing using machine learning. Some indicators will need regular manual monitoring, while others can be automated. The benefit of ONN's research approach lies in the fact that it can remain independent, reveal its sources and methods and reproduce its results due to the open source nature of its work.

Second, ONN will invite a cohort of seasoned government officials (civilian and military), experts and academics from the region who know the nuances of the conflict and the levers of power to be members of ONN's Engagement Network. While these trusted third parties may not always agree, and will represent a diversity of political and technical expertise, they share ONN's goal of nuclear risk reduction. Members will meet regularly with ONN staff to advise them on research strategy, and to spot opportunities for positive impact in times of low conflict. These members will convene annually with ONN to train for times of crisis, share expertise and build trusting relationships. ONN sees the Engagement Network as the last line of defence before a nuclear catastrophe.

China, the DPRK, Japan, the ROK, Russia and the United States each have a vested interest in the future of the Korean Peninsula. It is ONN's aim to provide credible intermediaries with the necessary information and resources to address escalating conflict so that they can reach out to decision makers in real time to prevent nuclear exchange. ONN believes that this unprecedented hybrid approach to peacebuilding will yield tangible results that reduce the risk of nuclear weapon use in response to error, uncertainty or misdirection.

ABBREVIATIONS

CTBTO	Comprehensive Nuclear-Test-Ban Treaty Organization
DPRK	Democratic People's Republic of Korea
ICBM	intercontinental ballistic missile
KCNA	Korean Central News Agency
KCTV	Korean Central Television
KMPR	Korea Massive Punishment and Retaliation
KPA	Korean People's Army (DPRK)
KRW	Korean Republic won (ROK currency)
Mwe	megawatt electric
NATO	North Atlantic Treaty Organization
ONN	Open Nuclear Network
PLA	People's Liberation Army (China)
R&D	research and development
ROK	Republic of Korea
SLBM	submarine launched ballistic missile
SSBN	ballistic missile-carrying submarine
THAAD	Terminal High Altitude Area Defense
UN	United Nations
USFK	US Forces Korea
USFJ	US Forces Japan
WPK	Workers' Party of Korea (DPRK)

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One Earth Future's Open Nuclear Network programme is a non-aligned, non-governmental entity that seeks to increase security for all States by ensuring that nuclear decision makers have access to high quality, shareable open source information which enables them to make the best decisions in the face of escalating conflict.

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