



Center for Energy Studies | Report

Reaping the Whirlwind: How China's Coercive Annexation of Taiwan Could Trigger Nuclear Proliferation in Asia and Beyond

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Five years ago — and certainly a decade ago — coercive annexation of Taiwan by the People's Republic of China (PRC) might have seemed an extreme scenario. Unfortunately, this is no longer the case. The rising crescendo of PRC air and maritime pressure operations near the island, missile firings, and so on are bringing Beijing within a few steps of the maritime quarantine or similar operations that would likely be central to an attempt at coercive annexation.

Meanwhile, China's meteoric military buildup across the board gravely threatens other nations. Backstopping it all is a major nuclear weapons ramp-up, the latest elements of which are detailed here to the very cutting-edge of public information, much of it from the Pentagon's just-released 2023 "China Military Power Report".^[1] Based on this information, we conclude that if the PRC succeeded in coercively annexing Taiwan, repercussions could include nuclear proliferation with regional — and even global — security consequences.

Even under a baseline scenario, a nuclear proliferation cascade following a PRC-coerced annexation of Taiwan could see hundreds of nuclear warheads added to stockpiles globally. More dire cases — for example, in which

Japan and/or South Korea nuclearized extensively, China responded, and the U.S. and Russia then each expanded their nuclear forces — could trigger a chain of proliferation that ultimately adds a thousand or more warheads to nuclear stockpiles globally. The addition of such warhead numbers, plus the entry of new nuclear powers with no nuclear command, control, or operations experience in the midst of a tense geopolitical environment, would be a recipe for instability. The risks that could result if these nuclear proliferation whirlwinds are unleashed should drive the U.S. to redouble its efforts to ensure that this Pandora's box is never opened.

How Would Coercive Annexation of Taiwan by the PRC Be Different Than Prior Crises?

Over six decades, the U.S. nuclear umbrella over key Asian allies has weathered multiple stress tests. These include China's 1964 nuclear test, U.S. normalization of relations with the PRC in 1972, the loss of the Vietnam War a year later, President Jimmy Carter's 1976 campaign pledge to withdraw ground troops from the Korean Peninsula, nuclear weapons development and deployment by India and Pakistan, and North Korea's acquisition of nuclear weapons.^[2] These prior disruptions shook the region's confidence in American security guarantees — and helped motivate South Korea and Taiwan to pursue secret nuclear weapons programs in the 1970s and 1980s that were later shuttered under U.S. pressure — but they did not shake the structure to its foundation.^[3]

American economic, technological, and military excellence kept U.S. power credible and granted the leverage needed to dissuade key East Asian states that were not nuclear as of 1965 from going nuclear (with the exception of North Korea). Washington was able to offer the “carrot” of coverage by a first-rate nuclear umbrella while wielding the “stick” of economic, technological, and hard security exclusion against countries that insisted on pursuing nuclear weapons capability. Furthermore, prior revisionists of the security order (such as North Vietnam and North Korea) were both small-to-medium powers whose actions unsettled the regional order but did not fundamentally call American alliance commitments into question. South Vietnam was not a U.S. treaty ally, and the U.S. led allied efforts to defend South Korea during the Korean War, boosting its credibility.

If the PRC coercively annexed Taiwan, by contrast, proliferation pressures would likely be the highest East Asia has seen in decades. At this point, only a coalition of states that includes the U.S. can credibly balance China in the conventional military realm. In the nuclear arena, none of China's East Asian neighbors can fully deter, much less balance, its power; North Korea is beholden to Beijing in critical respects, and the rest lack nuclear weapons. Both Japan and South Korea either possess (or are acquiring) formidable long-range conventional strike assets. Yet these would likely be insufficient to mitigate PRC nuclear coercion because they could not credibly threaten China's national leadership, critical infrastructure, and nuclear weapons complex to a degree proportionate to the threat of PRC conventional strike weapons (and their nuclear counterparts) to the Japanese and Korean homelands.

The cases of India and Pakistan offer relevant historical examples of how countries may respond to nuclear threats that lack a credible external counterbalance. The U.S. engaged with both countries (and in the case of Pakistan, offered substantial but circumscribed security support) but did not have alliance relationships or provide other security guarantees. This meant the U.S. ultimately failed to dissuade them either from acquiring or deploying nuclear weapons. Survivalist security concerns carried the day, with Pakistani President Zulfikar Ali Bhutto famously declaring in 1965 that “if India builds the bomb, we will eat grass or leaves, even go hungry, but we will get one of our own.”^[4]

China's East Asian neighbors are not currently locked into maximal rivalry with Beijing. But the South Asian example reflects the lengths to which nations will go if nuclear weapons acquisition comes to be seen as a survival imperative necessary to ensure national sovereignty in a world where they have concluded they are increasingly on their own.

Reinforcing that point: A successful coercive annexation of Taiwan would also leave PRC military forces mostly intact — and thus available as a credible coercive instrument. This, in turn, would give Beijing enormous leverage in Asia and beyond. Gains on Taiwan might even arouse the PRC's temptations to further expand its land territory by force, or use a combination of island conquests, feature construction ("island building"), and a much more aggressive military presence to effectively implement its own version of the Monroe Doctrine across maritime Asia.[5]

Such a chain of events could very plausibly trigger a crisis of confidence in the strength of Washington's commitment to use conventional or nuclear force in defense of a regional ally. After all, if the U.S. would not (or could not) deploy sufficient conventional military power (implicitly or explicitly backed by nuclear arms) to keep a quasi-ally and very strategically important society like Taiwan free, would American allies later be as willing to assume that Washington would risk Los Angeles or Seattle for Tokyo, Seoul, or the Senkaku Islands (uninhabited lands that are administered by Japan) to meet alliance obligations?[6]

Of course, it is not possible to answer that question conclusively until such a challenge concretely presents itself. But if evolving circumstances compelled allies ostensibly under the U.S. nuclear umbrella to ask such questions, the very act of asking begins to pencil in an answer along the lines of "perhaps not." Viewing nuclear weapons acquisition as a national necessity might not be far behind — either in the form of a sharing arrangement, in which U.S. "forward-based" weapons are delivered by host country aircraft, or else through the development of a sovereign nuclear deterrent.[7]

Key Motivator: Growing Security Dilemma for China's Neighbors

Proximity to the PRC is generating mounting insecurity, particularly for nations that suffer pressure from Beijing now — and may suffer still worse in the future. China's meteoric military buildup is rapidly adding an extraordinary number of weapons and weapons-delivery platforms across all domains, creating severe, and continually growing, security challenges for its neighbors and other nations. These nations are therefore reviewing and potentially reconsidering how best to ensure their own security.

Beijing already commands the world's largest ground forces, navy and other maritime forces,[8] and overall missile forces, as well as the region's largest military aviation forces. Under the auspices of the PLA Air Force (PLAAF), China also has one of the world's biggest and most sophisticated surface-to-air missile forces.[9] Perhaps of greatest concern for the United States and China's neighbors alike, Beijing has the world's largest arsenal of conventional ballistic and cruise missiles, controlled primarily by the PLA Rocket Force (PLARF). Table 1 tabulates the tremendous number and variety of missile systems already deployed by the PLARF.

Table 1 — PLARF Missile Systems Currently Fielded by China

Type of System	Number of Launchers	Number of Missiles	Estimated Range (km)
Intercontinental Ballistic Missiles (ICBM)	500	350	>5,500
Intermediate-range Ballistic Missiles (IRBM)	250	500	3,000-5,500
Medium-range Ballistic Missiles (MRBM)	300	1,000	1,000-3,000
Short-range Ballistic Missiles (SRBM)	200	1,000	300-1,000
Ground-launched Cruise Missiles (GLCM)	150	300	>1,500

Source: CMPR (“China Military Power Report”) 2023, 67.

Nuclear weapons policy is the sole preserve of China’s paramount leader. Here Xi is making his mark with a major ramp-up that departs greatly from his predecessors’ relative quantitative restraint regarding the production and deployment of nuclear weapons. A decade into Xi’s time in charge, China already has a rapidly-growing nuclear triad, second only to that of Russia and the United States, at over 500 operational nuclear warheads by May 2023, [10] and “approximately 350 ICBMs [intercontinental ballistic missiles] in its arsenal, all of which can reach CONUS [the continental United States].” [11] This trajectory offers a path to some form of overall China-Russia-U.S. parity with over 1,000 warheads projected by 2023 and 1,500 by 2035. [12] Much of the more than 1,000 PRC nuclear warheads the Pentagon anticipates by 2030 “will be deployed at higher readiness levels,” [13] and “most will be fielded on systems capable of ranging the CONUS.” [14]

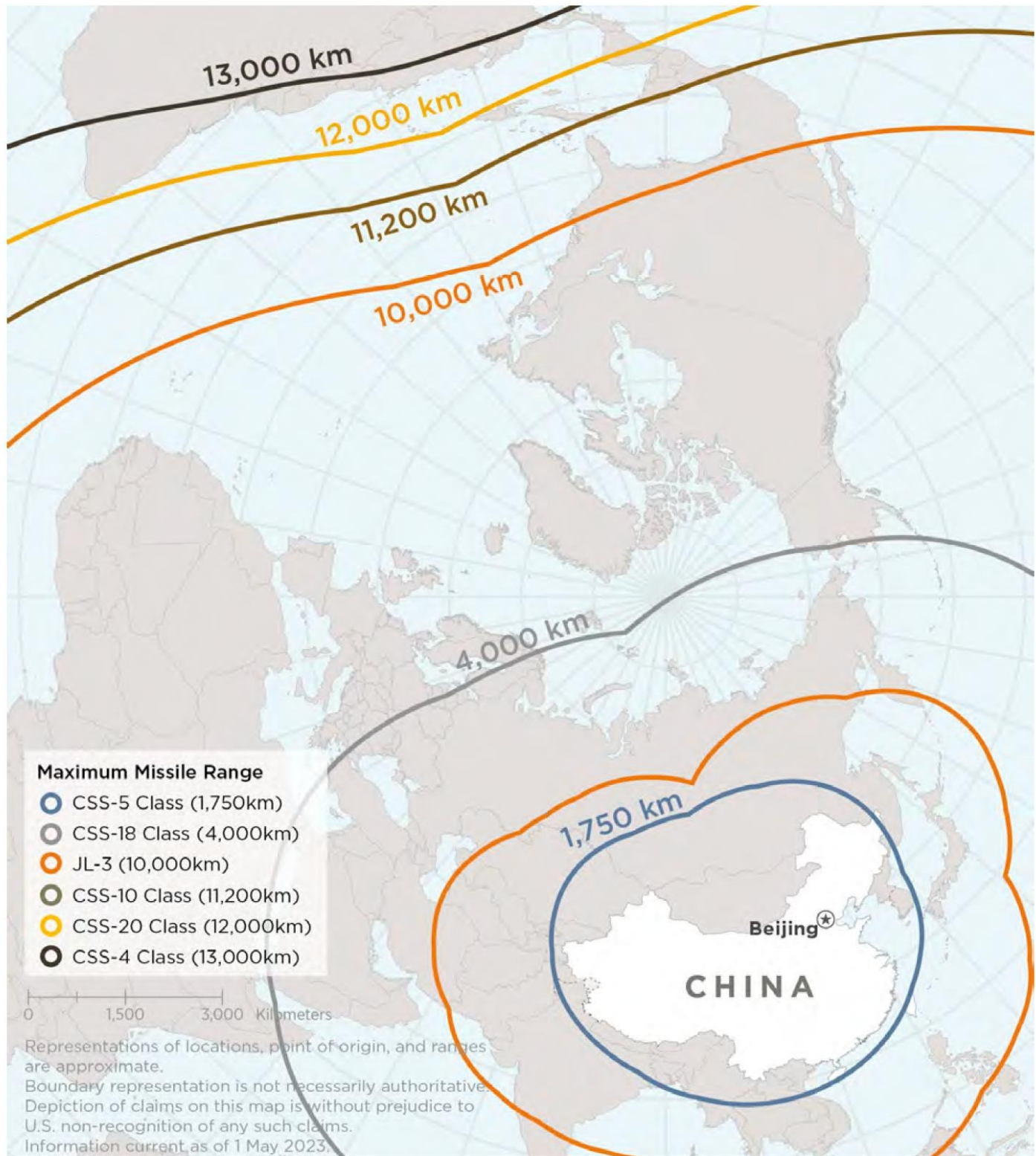
Following its own repeated public underestimates, the Pentagon emphasizes, “These changes to the numbers, capability, and readiness of the PRC’s nuclear forces in the coming years are likely to outpace potential developments by the force of any competitor.” [15] Figure 1 depicts the respective range rings of PRC nuclear ballistic missiles that are already operational.

Figure 1 — Nuclear Ballistic Missiles Fielded by China

Such a rapid upsurge was unforeseen even by the Defense Department: “Compared to the PLA’s nuclear modernization efforts a decade ago, current efforts dwarf previous attempts in both scale and complexity.” [16] “Over the next decade, the PRC probably will continue to pursue selective qualitative parity with an increasing scope of U.S. and Russian capabilities,” the Pentagon projects. “The PLA seeks a diverse nuclear force, comprised of systems ranging from low-yield precision strike missiles to ICBMs with multi-megaton yields.” [17]

It appears the PRC’s goal is to have capabilities available at every rung of the potential escalation ladder to convince potential adversaries that Beijing can meet and overcome them in any scenario.

As part of the low-end of this “all-level” effort, China has reportedly developed “a lower-yield weapon ... for use against campaign and tactical targets that would reduce collateral damage.” [18] Potential related applications include “controlled use of nuclear weapons, in the warzone, for warning and deterrence.” The Pentagon judges that China’s DF-26 intermediate-range ballistic missile (IRBM) “is the PRC’s first nuclear-capable missile system that can conduct precision strikes, and therefore, is the most likely weapon system to field a lower-yield warhead in the near term.” [19]



Fielded Nuclear Ballistic Missiles

Source CMPR (“China Military Power Report”) 2023, 68.

To operationalize this ambitious approach, China under Xi is engaged in a gargantuan campaign of nuclear weapons development and deployment across the board. In 2022, China likely completed construction of three new solid-propellant silo fields, with 300+ new silos that can accept either DF-31 or DF-41 ICBMs — at least some already loaded.^[20] For multi-megaton warhead delivery utilizing liquid fuel,^[21] China is fielding a new DF-5C

silo-based ICBM. It is likely “developing an upgrade to” its existing DF-5 ICBMs with multiple independently targetable reentry vehicles (MIRVs). As part of these efforts, “The PRC is building more silos for DF-5 class ICBMs; increasing the number of brigades while simultaneously increasing the number of launchers per brigade.”^[22] Figures 2-5 plot and depict China's new solid-propellant ICBM silo fields and the training sites associated with them.

Figure 2 — PRC Solid Propellant ICBM Silo Fields and Associated Training Site Locations



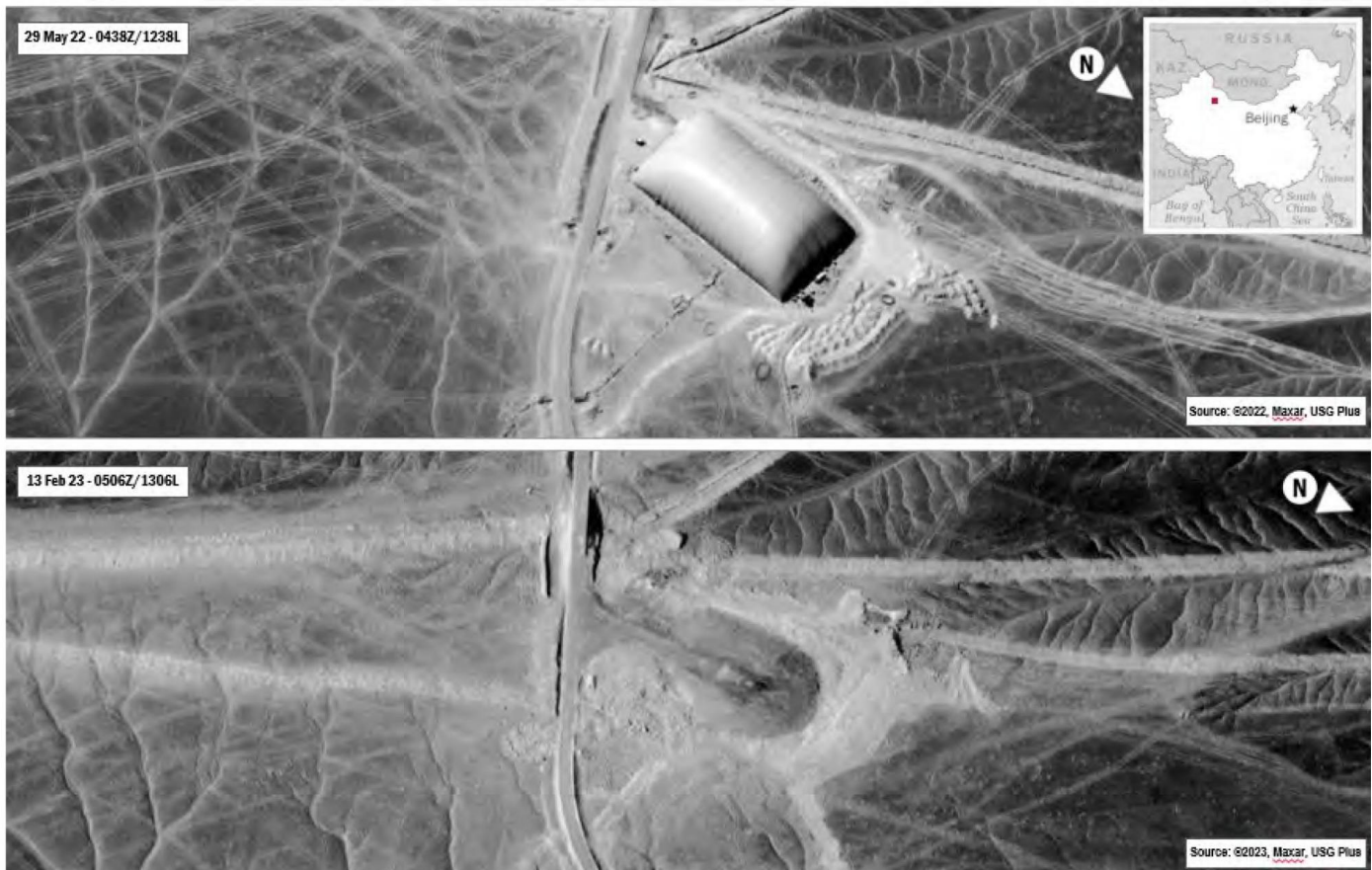
China: Solid Propellant ICBM Silo Fields and Associated Training Site Locations

Source: CMPR 2023, 113.

Figure 3 — ICBM Silo Externally Completed: Hami Silo Fields

Figure 4 — Yumen Silo Field Launch Sites

Figure 5 — Example of Military Garrisons Constructed at Newly Built ICBM Silo Fields: Guanzhou ICBM Silo Field Missile Garrison



China: ICBM Silo Externally Completed - Hami Silo Fields

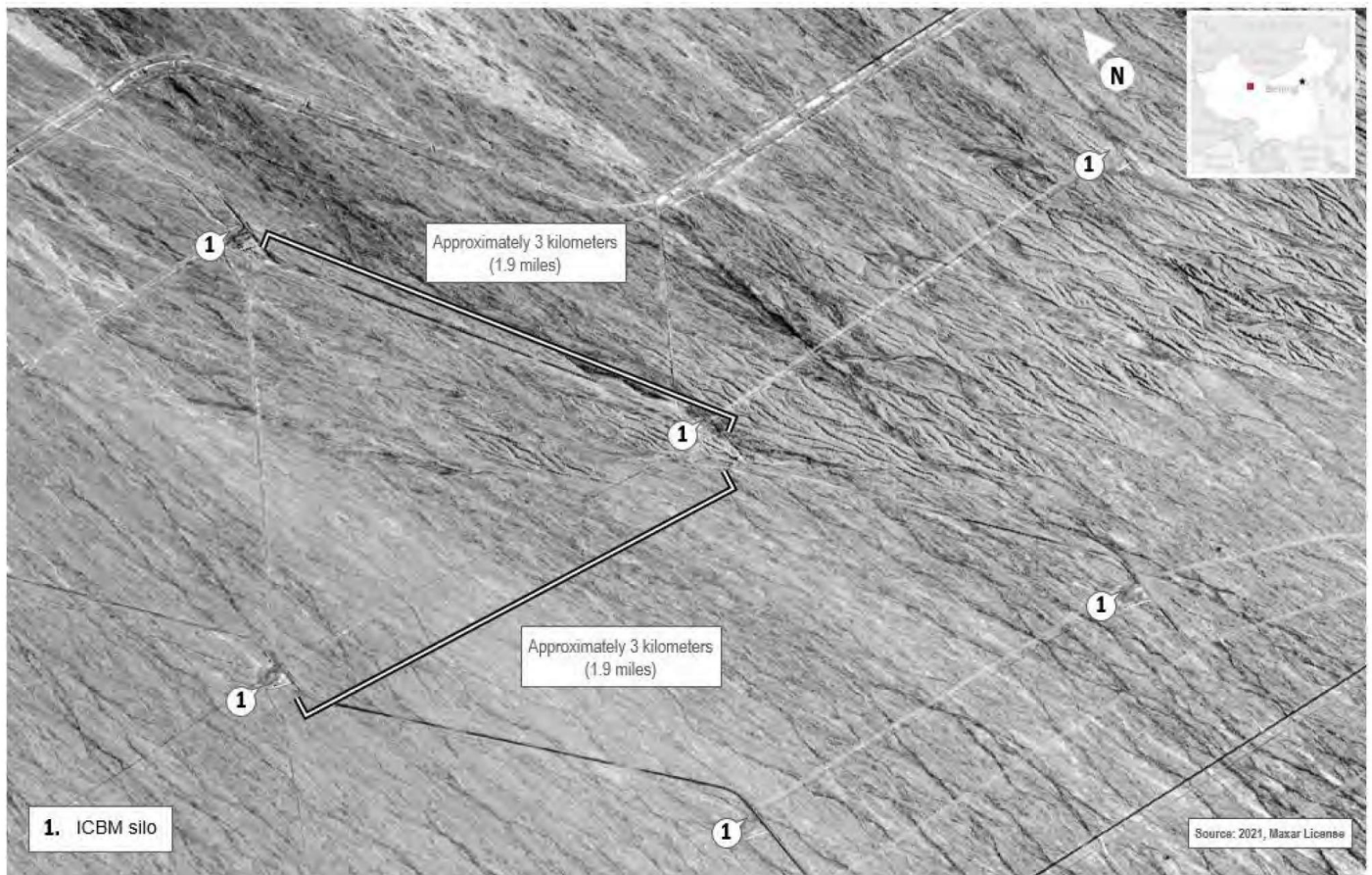
Source: CMPR 2023, 105.

Regarding solid-fueled, road-mobile ICBMs, China “is establishing additional nuclear units and increasing the number of launchers in mobile ICBM units.”^[23] The DF-41 “has improved range and accuracy” and as many as “three warheads per missile.”^[24]

Xi has tasked the PLA Navy (PLAN) to “accelerate its sea-based nuclear capability,”^[25] including through his “2018 directive for the SSBN [nuclear-powered ballistic missile submarine] force to achieve ‘stronger growth.’”^[26] China already has a portion of its six operational Type 094 Jin-class SSBNs conducting “near-continuous at-sea deterrence patrols,” outfitted with a combination of JL-2 and JL-3 submarine-launched ballistic missiles (SLBMs). JL-3 SLBMs can range the continental United States (CONUS) from PRC littoral bastions (e.g., in the South China Sea and potentially the Bohai Gulf). China continues to build additional Type 094 SSBNs, and in the “early 2020s,” will likely start construction of an improved Type 096 SSBN “probably intended to field MIRVed SLBMs.”^[27] Figure 6 depicts the addition of submarine piers at China’s SSBN base on Hainan Island in the South China Sea.

Figure 6 — PLA Navy Constructs Additional Submarine Piers at Yalong Naval Base

China is finally initiating the third leg of its modern nuclear triad with the “operationally fielded” H-6N bomber. This long-range airframe has an “air-to-air refueling probe” and uses “recessed fuselage modifications” to carry a nuclear-capable air-launched ballistic missile (ALBM) externally.^[28] “The ALBM carried by the H-6N appears to be armed with a maneuvering reentry vehicle, indicating that the ALBM, along with the DF-26 IRBM, is likely



China: Yumen Silo Field Launch Sites

Source: CMPR 2023, 114.

capable of conducting nuclear precision strikes against targets in the Indo-Pacific theater.”^[29] Additionally, there’s a high likelihood that China is “developing a strategic stealth bomber.”^[30]

As part of an effort to extend advanced nuclear weapons delivery options and circumvent American missile defenses, it’s also probable that China is developing “a strategic hypersonic glide vehicle and FOB [Fractional Orbital Bombardment] system.” On July 27, 2021, Beijing “conducted a 40,000-km hypersonic glide vehicle test” that “likely demonstrated the PRC’s technical ability to field a FOB system.”^[31] Importantly, the Soviet Union abandoned efforts to develop FOBs in part because of their extremely escalatory nature, which might incentivize preemptive strike.^[32]

China is underwriting its dramatic nuclear force expansion with commensurate research, development, production, and reprocessing facilities expansion, as well as potential unacknowledged future testing. Russia is literally helping to fuel this effort, providing highly-enriched uranium (HEU) for China’s two CFR-600 “national defense investment project” fast breeder reactors on Changbiao Island in Xiapu County, Fujian province.^[33] The Pentagon judges that China’s dual CFR-600 reactors will “probably” generate weapons-grade plutonium for nuclear weapons,^[34] and that each can produce “enough plutonium for dozens of nuclear warheads annually.”^[35] Sino-Russian cooperation in this regard is highly significant and concerning:

*“By December 2022, Russia delivered the first three batches of HEU nuclear fuel assemblies, to China for the first core loading and the first refueling of the CFR-600. In early 2023, think-tank reporting indicates **the quantity of HEU transferred from Russia to China for its CFR-600 reactors is more than the entire amount of HEU removed***



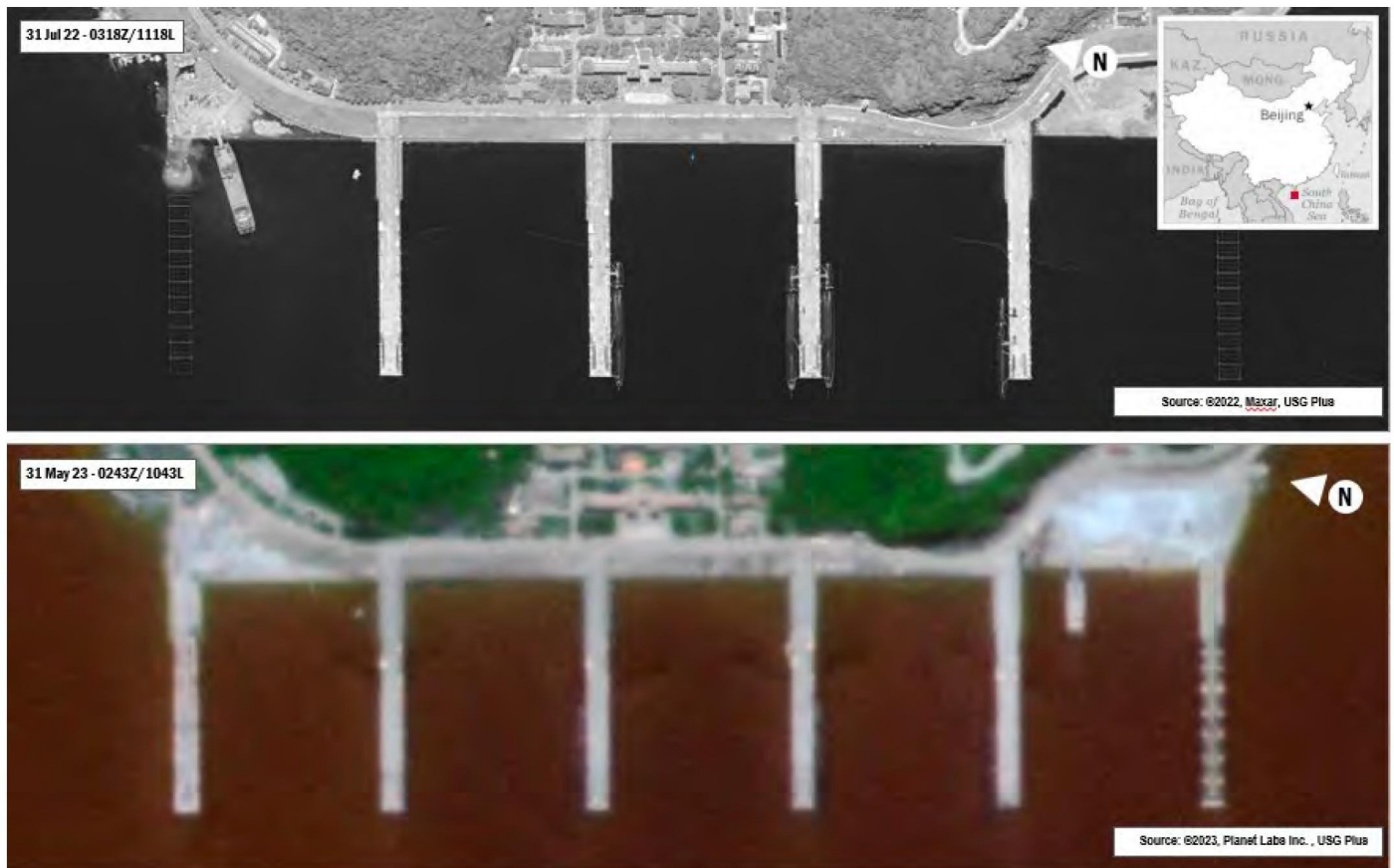
China: Military garrisons constructed at newly build ICBM Silo Fields – Guazhou ICBM Silo Field Missile Garrison

Source: CMPR 2023, 107.

worldwide under the U.S. and International Atomic Energy Agency (IAEA) auspices in the last three decades. In March 2023, the PRC and Russia signed an agreement that includes commitments for continued cooperation on fast reactor and reprocessing technology development, extending this relationship for “the decades ahead.”^[36] [Emphasis added.]

For weapons-grade plutonium extraction, China may utilize reprocessing Plant 404 at the Jiuquan nuclear complex in Gansu province^[37] (50 ton/year capacity); and/or, through their coming online by 2025, the dual plants being built at China National Nuclear Corporation (CNNC)’s Gansu Nuclear Technology Park in Jinta, several tens of kilometers southeast of Plant 404.^[38] China also endeavors “to expand and diversify its capacity to produce tritium.”^[39] Moreover, China’s “possible preparation to operate its Lop Nur nuclear test site year-round and lack of transparency on its nuclear activities have raised concerns regarding its adherence to the U.S. ‘zero yield’ standard adhered to by the United States, the United Kingdom, and France in their respective nuclear testing moratoria.”^[40]

Beijing is taking this ambitious approach despite declaring support for a Fissile Material Cutoff Treaty, which it is simultaneously undermining at the Conference on Disarmament as part of the typical PRC “say-do” gap concerning arms control that resists self-restriction while attempting to impose restrictions on others.^[41] Beijing has also “refused international calls to apply” International Atomic Energy Agency (IAEA) safeguards, “under a Voluntary Offer Agreement on its civilian reactors,” to the abovementioned reprocessing plants.^[42]



China: PLA Navy Constructs Additional Submarine Piers – Yalong Naval Base

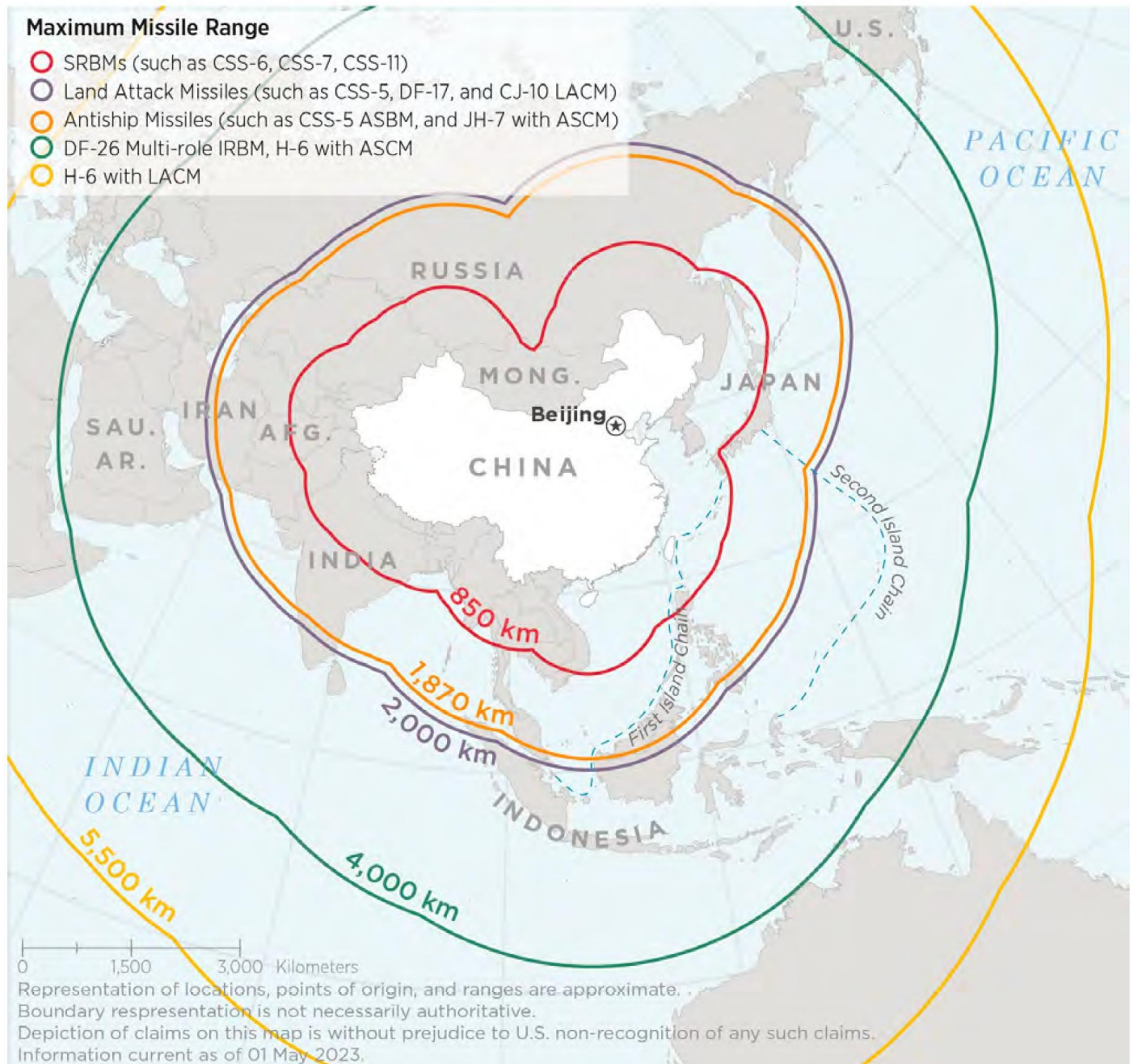
Source CMPR 2023, 108.

Beijing's nuclear strategy, redlines, and limits remain highly uncertain: China is developing its forces rapidly while offering neither substantial transparency nor dialogue, to say nothing of confidence-building measures, let alone binding arms control agreements of the sort that Washington and Moscow concluded successfully in later Cold War years. Beijing officially maintains a strict No First Use (NFU) policy, but it seems unlikely that it could be relied upon in the event of foreign strikes that threatened PRC command and control (C2) nodes or major strategic effects, or in the event that the Party and its Army faced failure in a Taiwan conflict.^[43]

Risks of confusion, misperception, and escalation are all heightened by PRC comingling of nuclear and conventional missiles, or the “dispersal of mobile missile systems to hide sites” whereby it may be unclear which type of system is where at a given time.^[44] As part of this risk-raising approach, China “may be exploring development of conventionally-armed intercontinental range missile systems. ... Such capabilities would allow the PRC to threaten conventional strikes against targets in the continental United States, Hawaii, and Alaska. Conventionally-armed ICBMs would present significant risks to strategic stability.”^[45] Figure 7 depicts the respective range rings of PRC conventional strike systems (i.e., missiles, some of which are aircraft-delivered, thereby extending their range) that are already operational.

Figure 7 — Conventional Strike Weapons Systems Fielded by China

Beijing has nevertheless “refused to join the Hague Code of Conduct or participate in other confidence-building measures designed to reduce the risk of accidental nuclear war.”^[46] And, continuing an established pattern, in



Fielded Conventional Strike

Source CMPR 2023, 69.

2022 “the PRC rejected requests by the United States to discuss strategic stability or strategic risk reduction, and other aspects of the PRC’s rapid nuclear buildup.”^[47]

Heightened readiness enables China to operationalize its swiftly shifting nuclear posture from “minimum deterrence” in rhetoric, to upper bands of “limited deterrence” in practice^[48] — but this amplifies the risk. Whereas most if not all PRC nuclear forces were previously maintained in “peacetime status with separated launchers, missiles, and warheads,” the PLARF now maintains an increasing portion of its forces on “combat readiness duty” and “high alert duty” — “which includes assigning a missile battalion to be ready to rapidly launch.”^[49] Furthermore, at least part of PLARF nuclear forces, including the new silo-based ICBMs entering the PLARF, “will probably be operating under China’s developing ‘Early Warning Counterstrike’ (预警反击) posture

(the PLA term for Launch On Warning, or LOW), enabling a rapid responsive nuclear strike”[50] “before an enemy first strike can detonate.”[51] To enable a LOW posture, China has developed ground- and space-based sensors, and trained accordingly. “As of 2022, the PRC likely has at least three early warning satellites in orbit,” the Defense Department asserts.[52] In yet another area of growing Russo-Chinese cooperation, Putin declared in 2019 “that Russia is aiding the PRC in developing a ballistic missile early warning system.”[53]

Even without factoring in China's increasingly bellicose statements and aggressive actions under Xi, the sheer size, scope, and trajectory of its military ramp-up leads neighbors such as Japan and South Korea to question their security from both PRC conventional and nuclear threats, and how both they themselves and their alliances with the United States can deter PRC coercion and defend against it as necessary. As the military balance continues to worsen and the PRC builds nuclear capabilities that may enhance its ability to cast doubt on the viability of America's nuclear umbrella in Asia, decision-makers in Tokyo, Seoul, and beyond will seek further assurance that America can reliably provide extended deterrence. Should they develop sufficient doubts concerning the adequacy of the guarantees Washington offers, or their likely reliability in practice (the latter of which would certainly come under question if the PRC coercively annexed Taiwan), then they might be motivated to consider options that were previously rejected outright or shelved given the potential difficulty and downsides.

Assessing the Nuclear Weapons Potential of Key East Asian Powers

In his authoritative study of the subject, MIT professor Vipin Narang, who currently serves as principal deputy assistant secretary of defense for space policy at the U.S. Department of Defense,[54] draws on his exceptional insights as both a scholar and practitioner to offer a comprehensive catalogue of nuclear options available to decision-makers. He warns,

“So long as nuclear weapons exist and are perceived to be a valuable security and political tool, states will continue to seek them. Possible nuclear aspirants in the future do not just include American adversaries such as Iran and Syria but also ‘friends’ such as Saudi Arabia. Even formal U.S. allies such as Japan, South Korea, Turkey, and even Germany may one day disrupt the East Asian and European security architectures by deciding that an independent nuclear weapons capability is preferable to depending on Washington's security commitments.”[55]

In Narang's analysis, a potential nuclear aspirant's four main options are hiding, sheltered pursuit, hedging, and sprinting.[56]

“Hedging is a strategy to develop a bomb *option*,” Narang explains, “laying the groundwork for weaponization in the future under some set of strategic conditions.”[57] Hedging may be subdivided into the minimalist category of technical hedging and two progressively more robust categories: “insurance hedging” and “hard hedging.”

Insurance hedging, Narang explains, “involves steps to reduce the time to the bomb should a state need to develop nuclear weapons (for example, if a security threat intensifies or if the hedger is abandoned by an ally).”[58] Hard hedgers, by contrast, “attempt to become threshold nuclear states with many of the pieces in place for a functional nuclear weapons program. They have potentially intense demand for nuclear weapons but intentionally stop short of the finish line.”[59] In sum, “Hedgers are not failed proliferators, they are simply warming up and deciding whether they will eventually run the race.”[60]

Adding to uncertainty and concern, Narang cautions, “Categorizing types of hedgers in real time may be difficult because the activities that distinguish hard hedging from insurance hedging, for example, consist of technical

work and deliberation that is likely done in secret. In practice, most external observers may assume that anything resembling technical hedging could very well be hard hedging.”[61] This means, in practice, that even if the U.S. government could detect the difference, other regional governments and societies might assume the worst regardless.

Sprinting, an openly acknowledged effort to “develop a nuclear weapons capability as quickly as possible,” almost always involves attempted “tactical obfuscation.”[62] Importantly, Narang emphasizes, “if a state directs the necessary resources to a nuclear weapons effort and is immune from economic or military preventative action, its prospects for achieving its goals are very high.”[63] Indeed, “contrary to the conventional wisdom that successful nuclear proliferation is rare, over *half*— ten of nineteen — of the active proliferators succeeded in developing nuclear weapons. Within active proliferators, sprinters ... have never failed to get the bomb.”[64]

Applying Narang's framework to American allies and partners in East Asia, Taiwan pursued insurance hedging from 1967-74 and then a hidden nuclear program from 1974-88, but it ultimately failed to keep its program concealed. Under intense pressure from Washington, it abandoned its program following the defection of Chang Hsien-Yi, deputy director of Taiwan's Institute of Nuclear Energy Research, to the United States in 1988.[65] If not for Chang's defection, Narang argues, “it is entirely possible that Taiwan would have succeeded in building nuclear weapons through a hiding strategy.”[66]

Japan is currently hedging,[67] specifically as “the quintessential insurance hedger in the international system”[68] from 1954 to the present.[69] But it is also a potential sprinter.[70] Narang emphasizes,

“The quintessential example of nuclear hedging where a pursuer faces an acute security threat but benefits from a formal alliance is Japan. Japan thus uses the implicit threat of nuclear breakout with its insurance hedge to elicit stronger commitments from the United States, but also to put the pieces in place for an independent nuclear deterrent should it ever face abandonment”[71] ... or if the severity of its underlying threats increases to the point that the alliance with the United States no longer meets its security needs.”[72]

Specifically, Japan's putting the technical pieces in place “comprises a very real, and potentially swift, pathway to a nuclear weapons arsenal in the event of a rapid deterioration of Japan's security environment, either because its underlying threats ... become unbearably menacing or because the U.S. alliance is insufficient to meet Japan's security needs (or both).”[73]

Such potential changes are not simply theoretical in nature: “Any time there has been a perturbation in the external security environment that causes Japan to question America's extended deterrent, Japanese leaders — across all parties — have not so subtly mentioned the threat to go nuclear if American security guarantees are deemed insufficient to Tokyo,” Narang writes.[74]

After pursuing secret nuclear weapons efforts from 1970-74, when it feared American abandonment,[75] South Korea has subsequently pursued insurance hedging.[76] While South Korea lacks Japan's plutonium reprocessing ability, it has much stronger popular support for nuclear weapons.[77] “Historically, some 60-70 percent of the South Korean public supports possessing independent nuclear weapons,” Narang notes, “which is remarkably high compared to most states.”[78]

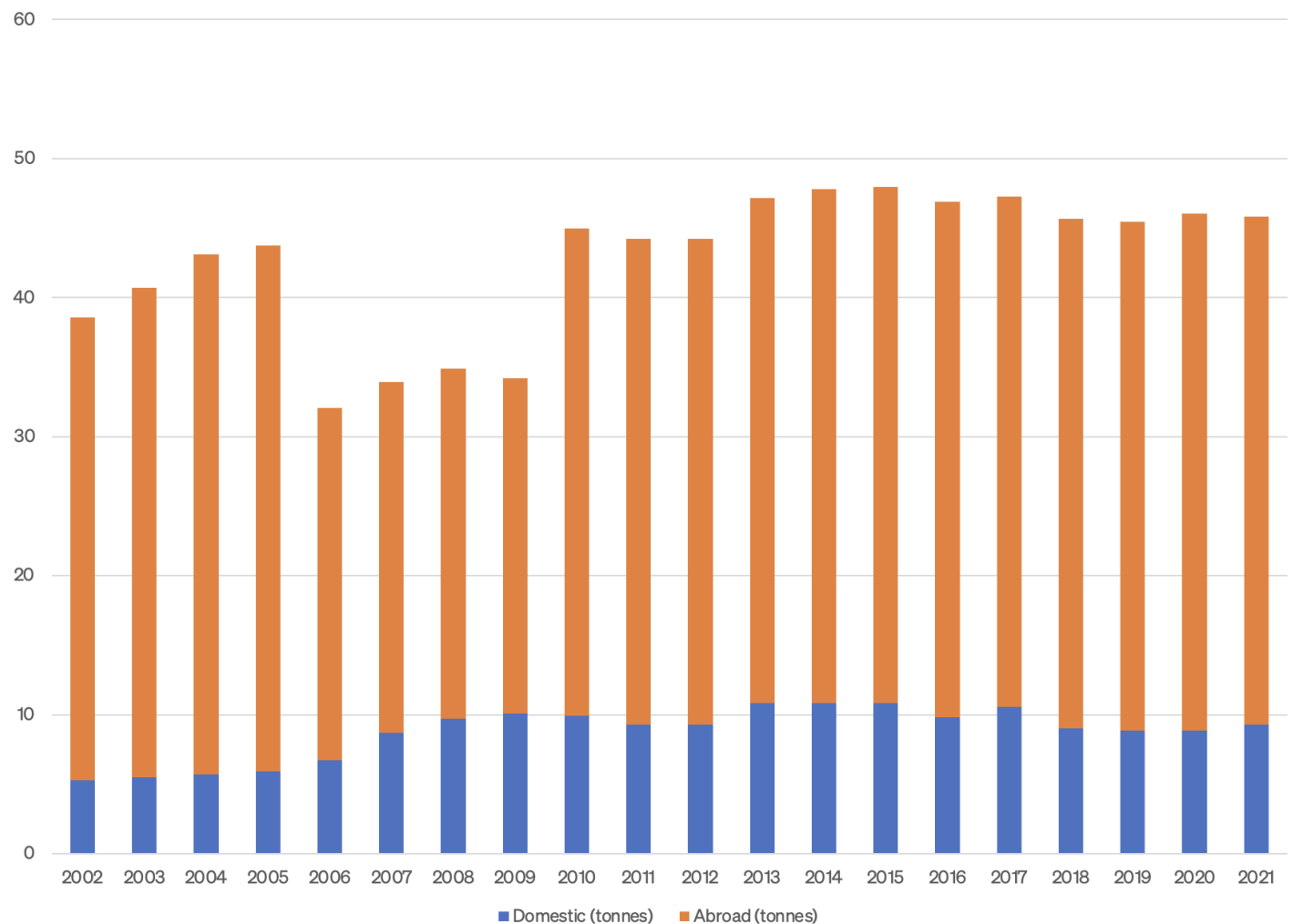
“In many ways, South Korea may be more willing to pursue an active weaponization strategy if it continues to fear abandonment and with such high levels of public support for nuclear weapons,” he concludes.[79]

Not all states would have the economic, industrial, and technological capacity to take the nuclear road, but Japan and South Korea clearly would. We accordingly offer a summary of each country's nuclear weapons acquisition potential, as well as a brief assessment of the risks for conflict that could be sparked by a Japanese or South Korean decision to approach or cross the weaponization threshold.

A. Japan

For its part, despite consistently high political opposition across much of its society to nuclear weapons *thus far*, [80] Japan has the highest nuclear potential among non-nuclear weapons states in Asia. China's simultaneous unwillingness to embrace concrete arms control commitments, its emphasis on breeder reactors, and its determination to control the nuclear fuel cycle may have particular influence in Japan, which has similar sovereign reprocessing capabilities despite previously forswearing the development of nuclear weapons altogether.[81] Japan possesses a full onshore nuclear fuel cycle, including the world's third-largest commercial reprocessing plant, in Rokkasho.[82] Furthermore, it already possesses what is likely the world's largest plutonium stockpile — nearly 45 metric tons at the end of 2021, with approximately 9 metric tons held domestically under sovereign control (Figure 8).

Figure 8 — Japan Plutonium Inventory, By Location (Metric Tons)



Source Japan Atomic Energy Commission.

For perspective, 1 metric ton of plutonium could produce 162 “Fat Man” atomic bombs, or 250 “pits” for a modern thermonuclear weapon.[83] Japan has also demonstrated the ability to domestically produce space launch vehicles — implying a clear capability to eventually produce large ballistic missiles.

Contemporary events are reanimating nuclear discussions in Japan, with the most forward-leaning statement coming in February 2022 from the late former Prime Minister Shinzo Abe. Abe, although a Liberal Democratic Party politician without a government post, raised the idea of Japan engaging in “nuclear sharing” agreements, similar to the arrangements the U.S. has with Belgium, Germany, and the Netherlands. Under these agreements, nuclear weapons are stored in-country under U.S. custody but are deliverable by nuclear-capable aircraft possessed by both the U.S. and the host country.[84]

Prime Minister Fumio Kishida quickly denounced Abe’s remarks as “unacceptable,” but the very fact that any politician with Abe’s stature would even float the idea of nuclear sharing is significant.[85] It suggests that a more profound world change (for example, the conquest of Taiwan by the PRC) might actually shift Japanese public opinion in a more pro-nuclear weapons direction.

Such a shift might take the form of the “phased approach” that Narang hypothesizes, in which even “domestic hurdles to overt weaponization generally faced by political elites” in Japan could give way to the “abandon[ment] of insurance hedging for a more active nuclear weaponization strategy.”[86] As part of this, Narang elaborates, “Should Tokyo perceive an existential threat from China, it may force the United States to develop ‘novel’ sharing procedures with the Japanese to forestall them breaking out of their modern-day insurance hedge.”[87]

If China coercively annexed Taiwan, Japan would quite possibly first try to establish a NATO-style sharing arrangement. That said, U.S. inaction could open the door to Japan more actively pursuing a sovereign nuclear deterrent option.

Consider that in his February 2022 remarks, Abe also pointedly noted that, had Ukraine retained nuclear weapons following the fall of the Soviet Union, it might have prevented Russia from invading.[88] This statement is of particular relevance given the potential for nuclear weapons to help a smaller state deter a militarily larger one. While real-world examples are scarce so far, U.S. restraint toward North Korea, despite Pyongyang’s broad range of sometimes violent regional troublemaking, suggests that nuclear weapons do in fact have a powerful deterrent effect.

On a practical level, Japanese pursuit of nuclear weapons would be difficult to conceal in a democracy with a relatively free press. There would likely be a window of years between the decision to pursue nuclear weapons and the actual deployment of weaponized systems — a period in which an adversary state like China might conclude that it should conduct armed coercion or warfare against Tokyo immediately, rather than wait for Japan to become a more capable foe.[89] Concretely speaking, revelations of a Japanese nuclear weapons program amid a loss of confidence in the American conventional and nuclear umbrellas could, for instance, prompt acceleration of PRC efforts to physically seize control of the Senkaku Islands.

A preemptive PRC attack on Japan’s home islands would appear to be a much lower probability scenario, especially if key nuclear assets were located underground and in hardened facilities.[90] Such a situation would demand multiple waves of air and/or missile strikes through robust Japanese air defenses and would likely fail to destroy the program. Preemptive strikes would also potentially spark retaliation by Japan against targets in China — and trigger American intervention.

The wild card in all scenarios of preemptive strikes on Japanese (or South Korean) nuclear programs is that the U.S., even if its strategic position in East Asia was undercut by unwillingness to physically prevent the PRC from coercively annexing Taiwan, would, like China, retain its full military power. It is thus plausible that decision-makers in Beijing would choose to accept South Korean and possibly even Japanese nuclearization rather than risk war with the United States. This would be especially likely since regional states' nuclearization would not prevent economic coercion by the PRC, nor would it be a meaningful buffer against "gray zone" actions by China's shadowy Maritime Militia and other "deniable" instruments of national power.[91]

B. South Korea

With North Korea's nuclear threat growing, Republic of Korea (ROK) President Yoon Suk Yeol made an unprecedented — if carefully caveated — statement at a joint policy briefing by his defense and foreign ministries on Jan. 11, 2023: "It's possible that the problem gets worse and our country will introduce tactical nuclear weapons or build them on our own. If that's the case, we can have our own nuclear weapons pretty quickly, given our scientific and technological capabilities." [92]

At the White House on Apr. 26, 2023, to mark the 70th anniversary of the U.S.-ROK Alliance, Yoon signed the Washington Declaration with President Joe Biden. [93] In "reaffirm[ing] South Korea's intention to stay in the Nuclear Nonproliferation Treaty (NPT)," the Yoon administration effectively "set aside the prospect that South Korea would develop and deploy an independent nuclear weapons capability in favor of a robust alliance-centered response." [94]

Under normal circumstances, Seoul would probably not risk jeopardizing its security partnership with Washington by openly pursuing nuclear weapons breakout capability in the form of sovereign enrichment or reprocessing infrastructure. It would also probably be unable to do so secretly in a society that is far more open and transparent than it was in the 1970s, when then-President Park Chung-hee began a nuclear weapons program. But what if a coercive annexation of Taiwan by the PRC and ensuing regional tectonic shifts changed the current position?

South Korea has a world-class civilian nuclear program, with 24 reactors in service that supply more than a quarter of the country's electricity needs. [95] Seoul's nuclear infrastructure is less comprehensive than Japan's; however, it does not control the nuclear fuel cycle and lacks the domestic uranium enrichment or reprocessing ("plutonium recovery") facilities that would be required to build nuclear weapons. South Korea differs fundamentally from Japan in that while it lacks some of the key nuclear fuel cycle infrastructure, public support for nuclear weapons acquisition appears far stronger.

Many in South Korea already question U.S. extended deterrence. [96] Nuclearization is not a radical proposal in South Korea, where 76% of respondents in a February 2023 poll supported acquiring nuclear weapons as a deterrent option against North Korea and China. [97] While far from conclusive, public support in South Korea for nuclearization has trended upward for years, especially since Russia's assault on Ukraine, and has remained robust even following reassurance from the Washington Declaration.

Seoul Mayor Oh Se-hoon — who is a member of Yoon's own party and South Korea's second most powerful elected official, with the ability to attend Cabinet meetings and communicate with the president directly — stated in a Sept. 16, 2023, interview: "Only nukes can counter nukes." Oh underscored the highly contingent nature of

South Korean opinion with regard to nuclear weapons: “If the U.S. stationed nuclear weapons here, we wouldn’t have to talk about developing our own nuclear weapons.”^[98]

A successful coercive annexation of Taiwan by the PRC — which would likely both amplify the North Korean threat by blunting U.S. military credibility and also increase the PRC’s coercive options with regard to South Korea — could substantially intensify calls for a nuclear deterrent under South Korean control.

It is plausible that an America whose credibility was tarnished by an inability to deter coercive annexation of Taiwan might redouble its efforts to bolster relationships with formal treaty allies. For example, it might affirm support for a South Korean nuclear weapons program and pledge to take kinetic action against any attacks on it. Indeed, some voices (including former President Donald Trump, a 2024 presidential contender) have suggested at various points during the past decade that the U.S. might have to accept Japanese and South Korean acquisition of nuclear weapons to ease the burden of extending the U.S. nuclear umbrella.^[99]

Pursuit of nuclear weapons, if discovered by the PRC and/or North Korea, could expose South Korea to the risk of preemptive attack.^[100] That said, South Korea maintains enough sovereign conventional warfare capacity directed at North Korea that if Pyongyang were to risk a war, it would potentially either topple the Kim Jong Un regime or prompt Pyongyang to use nuclear weapons itself, with a likelihood of American intervention. Under any of these scenarios, the risk/reward balance would be distinctly unfavorable for Pyongyang, which would have to choose between the risk of a nuclear neighbor (albeit under a stable, democratic government) or a potentially regime-ending war.

For China, its conventional combat power, already substantial nuclear arsenal, and lack of bitter history with South Korea (unlike Beijing’s relationship with Tokyo) would also likely tilt the risk/reward balance away from kinetic action against an emerging South Korean nuclear program. Beijing would be more likely to take diplomatic and extraterritorial economic punitive actions against firms (whether French, Indian, Russian, or American) that assisted South Korea with nuclear weapon development. It might also attempt cyber-sabotage, as the U.S. and Israel have reportedly done against Iran’s nuclear program.^[101]

North Korea would have fewer nonmilitary options due to its lack of global diplomatic and economic heft. Given Pyongyang’s historical pattern of actions, cyberattacks and/or physical sabotage operations — perhaps using special operations forces — would be plausible options. They would endure even if South Korea acquired a sovereign nuclear deterrent, and South Korea would remain vulnerable to a variety of potential North Korean provocations.^[102] An existing example of a nuclear arsenal failing to prevent a destabilizing provocation comes from the 2008 Mumbai attacks, in which Lashkar-e-Taiba terrorists trained in Pakistan infiltrated India’s commercial capital, Mumbai, by boat and launched a 60-hour attack that killed 172 people.^[103]

The dynamics described above merit close attention: The pressure on policymakers in the U.S. and other countries would be intense owing to the short time frames involved, driven by South Korea’s technical competence and preexisting weapons systems, which could plausibly be adapted to deliver nuclear warheads.

Consider an analysis performed in 1977 after several years of international turbulence akin to what the 2020s have brought thus far. Oak Ridge National Laboratory (ORNL) was asked to assess the prospects for the building and operating of covert reprocessing facilities by non-nuclear weapons states. The ORNL experts estimated that a “small” reprocessing plant could be built within four to six months after breaking ground, yield 10 kilograms (kg) of plutonium within a week of commencing operations, and yield 5 kg/day thereafter — enough for at least one

nuclear weapon per week.[104] An analysis of the ORNL report by the U.S. Government Accountability Office (GAO) added additional time based on other requirements, such as post-construction plant testing and diversion and transportation of spent fuel to the plant.

Ultimately, the GAO found that the ORNL estimate of four to six months “should be considered credible in some circumstances,” while the Department of Energy estimated 19 months, the Arms Control and Disarmament Agency estimated 24 months or more, and the Congressional Research Service calculated that 24 to 30 months would be required.[105] Weaponizing a device would likely take even more time, with at least one Korean nuclear scientist estimating in 2018 that South Korea would need two to three years to actually build an atomic bomb. [106] If South Korea's now world-class science complex and techno-industrial base were mobilized in pursuit of nuclear capability under critical strategic circumstances, it would be reasonable to assume Seoul could produce deployable fission devices very quickly.

Japan currently has the highest nuclear potential thanks to its massive plutonium stocks, but South Korea would likely have an edge in rapidly developing a proven indigenous delivery system. Japan's “peace constitution” has hindered the development of longer-range strike missile platforms, a deficiency highlighted by the December 2022 announcement that Japan's self-defense forces were seeking to spend more than \$2 billion to purchase “several hundred” Tomahawk cruise missiles.[107] South Korea, by contrast, now fields multiple land-attack cruise missiles with ranges between 500 kilometers (km) and 1,500 km and short-range ballistic missiles with ranges from 180 km to 800 km.[108]

In April 2022, South Korea flight-tested two submarine-launched ballistic missiles based on the 500 km-range Hyunmoo-2B.[109] The missile is conventional, but as Carnegie Endowment for International Peace Fellow Ankit Panda points out, “should the alliance with the United States fray in the future or South Korea's national defence needs drastically shift, these submarine/sea-launched ballistic missiles (SLBMs) would provide an immediately available foundation for a limited, survivable nuclear force.”[110] It is less clear whether Seoul could nuclearize its land attack cruise missiles, but considering that the old 11-kiloton American W34 fission warhead was used in the MK-45 ASTOR nuclear torpedo, it would appear possible to do so.[111] The MK-45's 19-inch/0.48-meter diameter is almost identical to that of the Hyunmoo land-attack cruise missile family.

Potential Parameters of a Multiregional Nuclear Proliferation Cascade

Policymakers who assume, logically, that a PRC coercive annexation of Taiwan would result in adverse consequences should also make the following assumption: A security shock severe enough to prompt either Seoul or Tokyo to go nuclear would probably also motivate them to pursue a sovereign deterrent capability. The next question would then be, “What impact might nuclear proliferation involving Asia's second- and third-largest powers have on nuclear weapons decisions by others in the region and beyond?”

A related question is how China would respond to Japanese nuclearization beyond direct preemptive assault. As discussed above, we believe Beijing would evaluate the situation on a risk-reward basis. Even if Japan announced it were only pursuing a limited nuclear deterrent, Beijing might find itself unpersuaded given that Japanese domestic plutonium stocks could theoretically support the construction of at least 1,000 warheads.[112] PRC leaders might well conclude they need even more than the 1,500 warheads their nuclear stockpile is predicted to have by 2035, according to the Pentagon's 2022 “China Military Power Report.”[113] That decision would have substantial ramifications for both American and Russian nuclear stockpile decisions.

As the 2022 U.S. Nuclear Posture Review notes, “By the 2030s the United States will, for the first time in its history, face two major nuclear powers as strategic competitors and potential adversaries. This will create new stresses on stability and new challenges for deterrence, assurance, arms control, and risk reduction.”^[114] The U.S. is already working to reconstitute the capability to produce 80 war reserve plutonium pits per year and has announced plans for the new W93 warhead to arm its submarine/sea-launched ballistic missiles.^[115]

Recapitalization of America's stockpile would, together with a nuclear competition between China and Japan, raise at least two disturbing scenarios, neither of which existed during the Cold War. In the first, U.S. planners would worry about the sum of all fears in an unstable tripolar nuclear great power system: the prospect of Russia and China presenting a combined nuclear front against the U.S. and its allies. This “two against one” concern was never realized during the Cold War because China used a minimum deterrence strategy with significant limitations on weapons technology, force structure, and posture, and because of mutual hostility between China and the Soviet Union. A world in which China and Russia were still more aligned strategically, and China fielded a larger and more capable nuclear force, would pose a far greater, yet less predictable, threat.

On the other hand, if relations between Beijing and Moscow sour, Russia might upgrade its forces faster, possibly build more strategic warheads, and consider new, potentially destabilizing deployment options to deter both the United States and a far larger and more capable Chinese nuclear triad.^[116]

Major nuclear expansion by the PRC following an annexation of Taiwan would also very likely pressure India to expand its stockpile and associated delivery options. Warning signs already loom on the horizon: In December 2022, India tested an updated version of its Agni-5 ballistic missile that allegedly now has a range of more than 7,000 km — sufficient to range all of China.^[117]

It is unclear how India might respond to the PRC's large, ongoing nuclear stockpile buildup (or a further accelerated one), but the French approach to deterring the USSR during the Cold War may be instructive, at least as far as Indian minimum deterrence of Beijing is concerned. During the Cold War, France's Deterrence Force maintained a triad with air-delivered warheads, 18 land-based intermediate-range ballistic missiles, and a fleet of six Redoubtable-class SSBNs, each with 16 ballistic missiles bearing six warheads apiece — a force of approximately 115 long-range strategic warheads.^[118] Considering contingencies involving China and Pakistan, the Indian nuclear stockpile could potentially double from its current level. Historical data suggest that Pakistan would then likely seek warhead parity with India.^[119]

Within East and Southeast Asia, it is unlikely that any country other than Japan or South Korea could realistically develop and deploy domestic nuclear weapons, even in a 10-year span. That said, Japan and South Korea's key natural resource supply trade partners in the region, Indonesia and Australia, would have substantial leverage to trade assured supplies of coal, grains, hydrocarbons, iron ore, nickel, and, in Australia's case, uranium reserves, for inclusion in nuclear security guarantees by Seoul, Tokyo, or potentially both.

The final set of implications comes from the Middle East. Iran was already continuing to edge closer to breakout capability even before the Israel– Hamas war sent shockwaves through the region and around the world following the unprecedented terror attacks in Israel on Oct. 7, 2023. If Iran were to acquire nuclear weapons, it would likely motivate Saudi Arabia to urgently do the same.^[120] As Saudi Crown Prince Mohammed bin Salman stated point-blank in 2018, “without a doubt if Iran developed a nuclear bomb, we will follow suit as soon as possible.”^[121]

Riyadh might do so first through a stopgap sharing agreement with Pakistan and subsequently through domestic production with foreign assistance. Indeed, Saudi Arabia has already announced plans to build a substantial nuclear system with a full fuel cycle (including enrichment) that would use domestic uranium resources and thus be exempted from International Atomic Energy Agency safeguards.^[122]

Riyadh's nuclear development appears to emphasize civilian nuclear power, but having a full domestic fuel cycle at the very least signals the existence of a potential nuclear hedge, especially if the local enrichment operator acquires the technical expertise over time to enrich beyond the 5% U-235 isotope concentration that typically characterizes commercial reactor fuel. If a U.S. loss of credibility either opened the door for Japan and South Korea to seek nuclear weapons, or a more isolationist U.S. actually encouraged them to do so, it would become very difficult to argue for continued nonproliferation measures against Iran or other parties in the Middle East.^[123]

Conclusion: US Policymakers Must Act Urgently to Deter China

All of the cases presented in this report suggest that keeping China from coercively annexing Taiwan is essential for managing nuclear proliferation risks — and for keeping the atomic doomsday clock a few ticks further back from midnight. One need only consider the dramatic, disturbing PRC nuclear weapons developments detailed with the very latest publicly available data in this report to see how previous long-held assumptions could well come under question in Tokyo, Seoul, and beyond. When viewed in the context of recent shocking developments and alleged associated intelligence failures — including the fall of Afghanistan's U.S.- and ally-supported government to the Taliban, Putin's invasion of Ukraine, and Hamas' terrorist assault against Israel — it becomes clear that national security across Asia, and the means to guarantee it, are in flux.

The power of nuclear deterrence resonates all the more with the example of a now-invaded Ukraine. In 1994, Ukraine abandoned the world's third-largest nuclear arsenal (composed of roughly 5,000 nuclear weapons) through the Budapest Memorandum. In exchange, Russia, Britain and the United States promised “that none ... would use force or threats against Ukraine and all would respect its sovereignty and existing borders.” And, “if aggression took place, the signatories would seek immediate action from the United Nations Security Council to aid Ukraine.”^[124]

By contrast, Israel, having developed nuclear weapons after a concerted, clandestine effort, now wields them as one of its few trump cards against the predations of an Iran that still lacks them. One must never forget that what may appear to outsiders to be “good enough” for a nation's security may not fully meet the needs of that nation's decision-makers, particularly those who are duty-bound to protect their homeland against the worst of all possible threats, regardless of the context and probability of such threats materializing. Would their American counterparts accept anything less than ironclad means on their behalf?

With all that being said, a significant portion of potential nuclear proliferation scenarios are highly contingent. If the security needs of Japan and South Korea continue to be met through robust, credible American extended deterrence, Tokyo and Seoul are unlikely to assume the risks and costs of indigenous nuclear weapons development and deployment in practice. The minute American deterrence and alliance credibility comes into question, however, things become subject to change in dangerous ways. Advancing any further along that path could send shock waves of instability and perilous geopolitical crosswinds and downdrafts — not least of all

between Japan and South Korea themselves, who remain haunted by history and benefit greatly from the crosscutting reassurances of American alliances.

It would thus be best for all parties concerned if the perilous Pandora's box of the PRC coercively annexing Taiwan is never opened in the first place. Given the horrors that the resulting whirlwind of proliferation could generate, it is crucial to keep the box closed. Armed with this stark realization, policymakers must shore up deterrence urgently before it fails catastrophically.^[125] It's not too late, but time is indeed running out.

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The views expressed here are the authors' alone and do not represent the positions of any organization with which they are, or have been, affiliated.

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[1] CMPR 2023 (China Military Power Report), *Military and Security Developments Involving the People's Republic of China 2023* (Washington, DC: Department of Defense, 2023),

<https://media.defense.gov/2023/Oct/19/2003323409/-1/-1/1/2023-MILITARY-AND-SECURITY-DEVELOPMENTS-INVOLVING-THE-PEOPLES-REPUBLIC-OF-CHINA.PDF>.

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[3] See, e.g., William Burr, "The United States and South Korea's Nuclear Weapons Program, 1974–1976," Wilson Center, March 14, 2017, <https://www.wilsoncenter.org/article/the-united-states-and-south-koreas-nuclear-weapons-program-1974-1976>; and Lyong Choi, "The First Nuclear Crisis in the Korean Peninsula, 1975–76," *Cold War History* 14 (2014): 71–90.

[4] Feroz Hassan Khan, *Eating Grass: The Making of the Pakistani Bomb* (Stanford, CA: Stanford University Press, 2012); "Pakistan Nuclear Overview," Nuclear Threat Initiative, November 5, 2019,

<https://www.nti.org/analysis/articles/pakistan-nuclear/>.

[5] Consider, for instance, Beijing's features reclamation program in the South China Sea. Niharika Mandhana, "How Beijing Boxed America Out of the South China Sea," *Wall Street Journal*, March 11, 2023,

<https://www.wsj.com/articles/china-boxed-america-out-of-south-china-sea-military-d2833768>.

[6] To be sure, Taiwan is not a U.S. treaty ally, but intense U.S. involvement in the island's security since the 1950s (including actions taken in multiple crises that in some instances brought the U.S. and PRC to the brink of war) likely cast Taiwan as a "quasi-ally" in the eyes of America's Asian treaty allies.

[7] China's neighbors would have doubly strong motivation after watching Russia invade Ukraine. Note, for instance, former President Bill Clinton's April 2023 comments: "I feel a personal stake because I got them [Ukraine] to agree to give up their nuclear weapons. ... None of them believe that Russia would have pulled this stunt if Ukraine still had their weapons." Ellie Cook, "Bill Clinton: My Nuke Deal to Blame for Russia's Invasion of Ukraine," *Newsweek*, April 5, 2023, <https://www.newsweek.com/bill-clinton-ukraine-war-russia-nuclear-weapons-deal-vladimir-putin-1792682>.

[8] For China's numerous world maritime superlatives, see Andrew S. Erickson, "Foreword," in Manfred Meyer (edited by Larry Bond and Chris Carlson), *Modern Chinese Maritime Forces*, Second Edition (Admiralty Trilogy Group, 1 October 2023), 3.

[9] CMPR 2023, 89.

[10] CMPR 2023, viii, 104, 111.

[11] CMPR 2023, 106.

[12] CMPR 2022 ("China Military Power Report"), *Military and Security Developments Involving the People's Republic of China 2022* (Washington, DC: Department of Defense, November 29, 2022), 98, <https://media.defense.gov/2022/Nov/29/2003122279/-1/-1/1/2022-MILITARY-AND-SECURITY-DEVELOPMENTS-INVOLVING-THE-PEOPLES-REPUBLIC-OF-CHINA.PDF>. On p. 111, CMPR 2023 reaffirms the 2035 projection of its 2022 predecessor: China "will continue growing its force to 2035 in line with previous estimates."

[13] CMPR 2023, 104, 111.

[14] CMPR 2023, 111.

[15] CMPR 2023, 111.

[16] CMPR 2023, 103.

[17] CMPR 2023, 109.

[18] CMPR 2023, 111.

[19] CMPR 2023, 112.

[20] CMPR 2023, 66, 104.

[21] Liquid fuels and oxidizers are very toxic but give missiles so equipped greater range and/or throw weight. Solid fuel missiles tend to be smaller than liquid fuel missiles and hence better suited for mobile systems.

[22] CMPR 2023, 107.

[23] CMPR 2023, 107.

[24] CMPR 2023, 107.

[25] CMPR 2023, 108.

[26] CMPR 2023, 55.

[27] CMPR 2023, 108.

[28] CMPR 2023, 108.

[29] CMPR 2023, 108–09.

[30] CMPR 2023, 109.

[31] CMPR 2023, 111.

[32] During 1982–84, Moscow dismantled its R-36-O orbital bombardment missile program and associated infrastructure. Asif A. Siddiqi, “The Soviet Fractional Orbital Bombardment System: A Short Technical History,” *Quest: The History of Spaceflight Quarterly* 7, no. 4 (Spring 2000): 27–28, https://web.archive.org/web/20130401170310/https://faculty.fordham.edu/siddiqi/writings/p15_siddiqi_quest_2000-04_fobs.pdf.

[33] CMPR 2023, 109. See also “CFR-600 (China Institute of Atomic Energy, China),” <https://aris.iaea.org/PDF/CFR-600.pdf>.

[34] CMPR 2023, 104.

[35] CMPR 2023, 109.

[36] CMPR 2023, 109.

[37] For background see Hui Zhang, “Pinpointing China’s New Plutonium Reprocessing Plant,” *Bulletin of the Atomic Scientists*, May 5, 2020, <https://thebulletin.org/2020/05/pinpointing-chinas-new-plutonium-reprocessing-plant/>.

[38] CMPR 2023, 110.

[39] CMPR 2023, 110.

[40] CMPR 2023, 110.

[41] CMPR 2023, 109.

[42] CMPR 2023, 110.

[43] CMPR 2023, 106.

[44] CMPR 2023, 106.

- [45] CMPR 2023, 67. See also Erickson, "China's Approach to Conventional Deterrence," in Roy D. Kamphausen, ed., *Modernizing Deterrence: How China Coerces, Compels, and Deters* (Seattle, WA: National Bureau of Asian Research, 2023), 12–27.
- [46] CMPR 2023, 113.
- [47] CMPR 2023, 110.
- [48] CMPR 2023, 110.
- [49] CMPR 2023, 106.
- [50] CMPR 2023, 106.
- [51] CMPR 2023, 112.
- [52] CMPR 2023, 112.
- [53] CMPR 2023, 112. More broadly, China and Russia signed the Russian-Chinese intern-governmental agreement bilateral missile and carrier rocket launch notification in 2009 and extended it for 10 years in 2021. CMPR 2023, 113. For background and details, see Erickson and Gabriel B. Collins, "Putin's Ukraine Invasion: Turbocharging Sino-Russian Collaboration in Energy, Maritime Security, and Beyond?" *Naval War College Review* 75, no. 4 (Autumn 2022): 91–126; especially 107.
- [54] Narang's portfolio includes space, missile defense, cyber, nuclear, and countering weapons of mass destruction policy. He also assists the assistant secretary of defense for space policy in his roles overseeing space as a warfighting domain, and as the principal cyber advisor to the secretary of defense. See: <https://www.defense.gov/About/Biographies/Biography/Article/3001188/dr-vipin-narang/>.
- [55] Vipin Narang, *Seeking the Bomb: Strategies of Nuclear Proliferation* (Princeton, NJ: Princeton University Press, 2022), 352.
- [56] Narang, *Seeking the Bomb*, 3.
- [57] Narang, *Seeking the Bomb*, 17.
- [58] Narang, *Seeking the Bomb*, 18.
- [59] Narang, *Seeking the Bomb*, 19.
- [60] Narang, *Seeking the Bomb*, 46.
- [61] Narang, *Seeking the Bomb*, 20.
- [62] Narang, *Seeking the Bomb*, 21.
- [63] Narang, *Seeking the Bomb*, 22.
- [64] Narang, *Seeking the Bomb*, 46.

- [65] Narang, *Seeking the Bomb*, 42–43, 13, 237, 255–69, 348–49.
- [66] Narang, *Seeking the Bomb*, 268.
- [67] Narang, *Seeking the Bomb*, 3, 8.
- [68] Narang, *Seeking the Bomb*, 84.
- [69] Narang, *Seeking the Bomb*, 42, 4, 12, 76, 342, 348.
- [70] Narang, *Seeking the Bomb*, 5, 36, 74–88, 175, 293, 336, 340, 343.
- [71] Narang, *Seeking the Bomb*, 30.
- [72] Narang, *Seeking the Bomb*, 46.
- [73] Narang, *Seeking the Bomb*, 81.
- [74] Narang, *Seeking the Bomb*, 83.
- [75] Narang, *Seeking the Bomb*, 87, 349.
- [76] Narang, *Seeking the Bomb*, 42–43, 342, 348.
- [77] Narang, *Seeking the Bomb*, 298–99.
- [78] Narang, *Seeking the Bomb*, 88.
- [79] Narang, *Seeking the Bomb*, 88.
- [80] Mark Fitzpatrick, “How Japan Could Go Nuclear: It Has the Smarts and the Resources, But Does Tokyo Have the Will?” *Foreign Affairs*, October 3, 2019, <https://www.foreignaffairs.com/articles/asia/2019-10-03/how-japan-could-go-nuclear>; Narang, *Seeking the Bomb*, 52, 347.
- [81] “Breeder reactors” are nuclear reactors that yield a greater quantity of fissionable material than they consume. They often use fast neutrons to drive fission chain reactions and may also surround the reactor core with a “blanket” layer of natural uranium that upon neutron impacts creates fissionable plutonium. World Nuclear Association, “Fast Neutron Reactors,” updated August 2021, <https://world-nuclear.org/information-library/current-and-future-generation/fast-neutron-reactors.aspx>.
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- [83] “Little Boy and Fat Man,” Atomic Heritage Foundation, July 23, 2014, <https://www.atomicheritage.org/history/little-boy-and-fat-man>; Arjun Makhijani, Howard Hu, and Katherine Yih, *Nuclear Wastelands: A Global Guide to Nuclear Weapons Production and its Health and Environmental Effects* (Takoma Park, MD: International Physicians for the Prevention of Nuclear War, Institute for Energy and Environmental Research, 1995), 58.

- [84] Jesse Johnson, "Japan Should Consider Hosting U.S. Nuclear Weapons, Abe Says," *Japan Times*, February 27, 2022, <https://www.japantimes.co.jp/news/2022/02/27/national/politics-diplomacy/shinzo-abe-japan-nuclear-weapons-taiwan/>.
- [85] Rupert Wingfield-Hayes, "Will Ukraine Invasion Push Japan to Go Nuclear?" BBC News, March 26, 2022, <https://www.bbc.com/news/world-asia-60857346>.
- [86] Narang, *Seeking the Bomb*, 87.
- [87] Narang, *Seeking the Bomb*, 99–100.
- [88] Rupert Wingfield-Hayes, "Will Ukraine Invasion Push Japan to Go Nuclear?" BBC News, March 26, 2022, <https://www.bbc.com/news/world-asia-60857346>.
- [89] Contemporary events may hold some lessons. In particular, part of the reason Russian President Vladimir Putin chose to invade Ukraine in 2022, rather than waiting, may have been the realization that as Ukrainian domestic weapon-makers motivated by the 2014 seizure of Crimea began to master standoff weapons like the Grom short-range ballistic missile and Neptune anti-ship missile, plus a host of other land warfare equipment, a future invasion would become far more costly and likely to fail. See, for instance: Rob Lee, "Moscow's Compellence Strategy," FPRI, January 18, 2022, <https://www.fpri.org/article/2022/01/moscows-compellence-strategy/>. (Quoting in relevant part: "Moscow likely believes a significant military escalation now would be less costly today than in the future if Ukraine continues to strengthen its military capabilities. If Ukraine had longer-range missiles, it could threaten Russian cities or military infrastructure, limiting Russia's ability to use military threats to coerce Kyiv.")
- [90] Iran's nuclear program offers a cautionary tale. Holding intermediate underground facilities such as Fordo at risk requires munitions such as the 30,000-lb GBU-57 Massive Ordnance Penetrator. Deeper facilities, such as the one revealed in 2023 at Natanz, could lie even beyond the range of GBU-57 type weapons. See John Gambrell, "An Iranian Nuclear Facility Is So Deep Underground That US Airstrikes Likely Couldn't Reach It," *Associated Press*, May 22, 2023, <https://apnews.com/article/iran-nuclear-natanz-uranium-enrichment-underground-project-04dae673fc937af04e62b65dd78db2e0>. Japan and South Korea each have mountain terrain that could see critical nuclear weapons facilities protected by 100 meters or more of rock. The PRC military currently appears to lack such earth penetrators and also does not field survivable low-observable platforms such as the American B-2 or B-21 that can tote such large bombs.
- [91] The U.S. reaction to China's nuclear program holds potential clues. In the run-up to the PRC's 1964 inaugural nuclear test, the John F. Kennedy and Lyndon B. Johnson administrations seriously considered preemptive military action against Beijing's nuclear program, even going so far as to ask the Soviet Union about the possibility of a joint operation. Ultimately, however, the U.S. chose to "live with" a nuclear China. William Burr and Jeffrey T. Richelson, "Whether to 'Strangle the Baby in the Cradle': The United States and the Chinese Nuclear Program, 1960-64," *International Security* 25, no. 3 (2000): 54–99, https://www.belfercenter.org/sites/default/files/files/publication/burr_and_richelson_winter_00_01.pdf.
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