1. International stability, human security and the nuclear challenge

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I. Introduction

In 2025 the world marks the 80th anniversary of the only times that nuclear weapons have been used in war—the bombings of Hiroshima on 6 August 1945 and Nagasaki three days later. In those eight decades, a great deal of death and destruction has been meted out in war but the taboo against using nuclear weapons has survived and grown stronger. This is, as the Nobel Peace Prize Committee noted when awarding the 2024 Peace Prize to the movement of Japanese nuclear survivors (*hibakusha*), Nihon Hidankyo, 'an encouraging fact'.[1] Nonetheless, new risks mean it is worth reviewing today's nuclear challenge.

Nuclear weapons pose existential risk for the world population, as does ecological disruption, the impact of which on peace and stability is starting to be felt in a context in which insecurity is already on the rise for other reasons.[2] The 2020s have so far seen more numerous armed conflicts compared to the previous three decades, with higher war fatalities and increased displacement of people.[3] Great power confrontation has returned to levels of intensity not experienced since the end of the cold war in 1989–91, including the articulation of nuclear threats.

It can therefore be no surprise that, in 2024, global security showed no overall improvement and some deterioration compared to the previous year. Several armed conflicts—not least in Ethiopia, Gaza, Myanmar and Sudan—continued to escalate.[4] Though the overthrow of the Assad regime in Syria in December 2024 offered the prospect of an end to the country's civil wars, a sustainably peaceful outcome was far from certain. Overall, the international capacity for peaceful conflict management continued to seem not quite up to its extraordinarily challenging tasks.[5] Russia's war of aggression against

[1] Nobel Peace Prize, 'Nobel Peace Prize for 2024', 11 Oct. 2024.

[2] Caesar, L. et al., *Planetary Health Check Report 2024* (Potsdam Institute for Climate Impact Research: Potsdam, 2024).

[3] See chapter 2 in this volume.

[4] See chapter 2, sections V, VII and VIII, in this volume.

[5] See Smith, D., 'International stability and human security in 2023', *SIPRI Yearbook 2024: Armaments, Disarmament and International Security*, pp. 7–14.

Ukraine continued, confrontation over Taiwan deepened, tensions on the Korean peninsula sharpened, and global politics were marked by increasing divisiveness and polarization sown by, among other causes of disputation, Israel's devastating offensive in Gaza.

New uncertainties originated in the November 2024 election of Donald J. Trump as President of the United States. These played out in the first quarter of 2025 once he had taken office and quickly came to occupy the foreground in discussion of world affairs. While the Yearbook is largely time-bound to the year preceding the year of publication, and this remains the case for all other chapters in this edition, this opening chapter therefore reflects not only on 2024 but on the much-changed environment that is unfolding at the time of writing. Though the outcome of these changes is hard to discern at present, the analysis would be incomplete if it ignored them.

Immediately upon Trump's inauguration, the new administration addressed multiple policy areas in a plethora of initiatives. President Trump threatened increased tariffs on imports from major trading partners including Canada, China, the European Union (EU) and Mexico, on a scale that risked serious effects on global trade. The tariffs were thereafter deferred, implemented, lifted and increased in a dizzying process.[6] The president made explicit territorial claims for Greenland, for Canada (though the degree of seriousness of this was hard to gauge), for control of the Panama Canal, and for Gaza, as a US-owned holiday resort after expelling all Palestinians.[7] He evinced apparent acceptance of Russia retaining territory it controlled due to its illegal invasion of Ukraine, while demanding access to Ukraine's mineral resources, and refused to back two United Nations resolutions condemning Russia's invasion.[8] In doing so, he paid little public attention to security concerns of the USA's European allies, whose leaders were publicly attacked by US Vice President J. D. Vance at the Munich Security Conference for suppressing free speech by, among other things, attempting to counter deliberate disinformation.[9] In similar vein, US president and vice president together berated President Volodymyr Zelensky of Ukraine in an unstructured press encounter at the White House, in what some commentators interpreted as

[6] 'Trump's tariff turbulence is worse than anyone imagined', *The Economist*, 5 Mar. 2025.

[7] Weizman, J., 'Trump on annexing Greenland: "I think it will happen"', Politico, 13 Mar. 2025; Weissert, W., 'Trump's remarks on Canada becoming the 51st state raise a lot of questions', AP, 13 Feb. 2025; Kube, C., Lubold, G. and Lee, C. E.,'Trump White House has asked US military to develop options for the Panama Canal, officials say', NBC News, 13 Mar. 2025; and 'What Donald Trump said about his plans to "take over" Gaza', Al Jazeera, 5 Feb. 2025.

[8] Bose, N. and Singh, K., 'Trump: Not practical for Ukraine to join NATO, get back all land', Reuters, 12 Feb. 2025; 'America has just tried to grab Ukraine's vast mineral wealth', *The Economist*, 16 Feb. 2025; Baskeran, G. and Schwartz, M., 'Breaking down the US–Ukraine minerals deal', Center for Strategic and International Studies, 27 Feb. 2025; and United Nations, 'At three-year mark of Russian Federation's invasion, General Assembly upholds Ukraine's territorial integrity, adopting two resolutions', Meetings Coverage no. GA/12675, 24 Feb. 2025.

[9] Coffee House, 'Read: J D Vance's full speech on the fall of Europe', *The Spectator*, 14 Feb. 2025.

a planned ambush.[10] The new administration thus launched a significant departure from previous policy and assumptions about global security and relations with allies. This led to some strong statements about the end of the Western alliance; the EU's foreign policy chief, for example, said, 'the free world needs a new leader'.[11] Such a statement suited the drama of the moment, but intense transatlantic diplomacy emphasized the importance of the USA in securing first an immediate ceasefire in Ukraine, and in the longer term the peace that European leaders see as a fundamental requirement for regional security.[12] The fear remained, nonetheless, that the US president was too easily influenced and misled by his Russian counterpart, Vladimir Putin, while what was touted as a US–Russian agreement on a partial ceasefire broke down almost immediately.[13]

The second Trump administration rolled back US policy on climate change, encouraging the fossil fuel companies to turn away from any plan for an energy transition.[14] Financial oversight came under attack with the firing of more than 12 inspectors-general responsible for fiscal propriety in federal government agencies and departments.[15] This was part of a broader attack on the federal bureaucracy, including the immediate suspension of thousands of staff of the US Agency for International Development (USAID).[16] The primary stakeholders in the US government's effective functioning are US citizens but the USA's economic scale, its military and political weight, and the role of USAID make these actions also a matter of international concern. A US economic slowdown created by tariffs raising prices and hampering trade would unavoidably have far-reaching consequences.[17] It would also be a concern if weaker regulation were to lead to rising corruption, not only in

[10] Stokols, E., 'Trump and Vance attack Zelenskyy in remarkable Oval Office exchange', *Politico*, 28 Feb. 2025.

[11] Badshah, N., ' "Free world needs a new leader", says EU foreign chief after Trump Zelenskyy row', *The Guardian*, 28 Feb. 2025.

[12] Horncastle, J., 'What the US ceasefire proposal means for Ukraine, Russia, Europe—and Donald Trump', *The Conversation*, 11 Mar. 2025; and Ross, T., 'How Starmer saved Ukraine's ceasefire as Trump and Zelenskyy raged', *Politico*, 12 Mar. 2025.

[13] Kovalev, A., 'Russia is only winning inside Trump's head', *Foreign Policy*, 10 Mar. 2025; Körömi, C. and Melkozerova, V., '"You see?" Russia broke Trump's hyped partial Ukraine ceasefire after 1 hour', *Politico*, 19 Mar. 2025; and Sauer, P., 'The limited ceasefire in Ukraine: What has been agreed and how will it work?', *The Guardian*, 22 Mar. 2025.

[14] White House, 'Unleashing American energy', Executive Order, 20 Jan. 2025.

[15] The exact number of inspectors-general who were dismissed was unclear, initially reported as 12 and subsequently as 17. See, respectively, Messerly M. et al., 'Trump fires independent inspectors general in Friday night purge', *Politico*, 26 Jan. 2025; and Savage, C., 'Fired inspectors general raise alarms as Trump administration moves to finalize purge', *New York Times*, 27 Jan. 2025.

[16] Faguy, A., 'Most USAID staff laid off or placed on leave by Trump administration', BBC, 24 Feb. 2025; and Sandefur, J. and Kenny, C., 'USAID cuts: New estimates at the country level', Center for Global Development Blog, 26 Mar. 2025.

[17] Kirby, J., 'Tariff war risks sinking world into new Great Depression, International Chamber of Commerce warns', *Wall Street Journal*, 4 Mar. 2025.

the world's largest market, but also in its relations with trading partners.[18] And the cuts in USAID staff and budget raise concerns about their impact both on development in many countries, and on peace and security, including, for example, the durability of the peace process in Colombia.[19]

In the first quarter of 2025, therefore, both allies and adversaries of the USA and all those in between found themselves navigating uncharted geopolitical and economic waters. The policies and stances of the Trump administration in its first weeks may not all endure for its full four years. But some will likely persist and embed themselves deep enough in American policy that the next administration, even if it is not cut from Trumpian cloth, will find it hard to do away with them entirely. This is the complex background to discussing the nuclear challenge in the coming years. This chapter first looks at the current state of arms control (section II), then at the prospects of a new nuclear arms race (section III), before returning to the context of a world order in crisis (section IV), in order to discuss how the nuclear challenge might be addressed (section V).

II. The state of nuclear arms control

The world's nuclear weapon inventory has been shrinking for almost 40 years, from a total number of bombs and warheads variously estimated at around 64 000 in the mid 1980s, to 12 240 at the start of 2025.[20] Within the totals, however, in the last few years, the number of nuclear weapons in military stockpiles (deployed warheads and those in central storage available for use) has started to increase. Thus far, these increases are confined to China and, on a much smaller scale, India; combined, the estimated increase from 2024 to 2025 by these two states amounted to 108 warheads—around 1 per cent of the global total military stockpile, and fewer than the number that were retired and dismantled. Though the numbers are small, they are one of the signs that the era of nuclear weapons reductions is coming to an end.

Bilateral nuclear arms control between Russia and the USA entered crisis some years ago and is now almost over.[21] The one remaining bilateral US–Russian nuclear arms control agreement is the New Strategic Arms

[18] Goldgeier, J. and Saunders, E. N., 'Does DOGE pose a national security risk?' *Foreign Affairs*, 7 Feb. 2025; and Stone, P., 'Kleptocrats to benefit from Trump DoJ's anti-corruption pause, experts warn', *The Guardian*, 10 Mar. 2025.

[19] Craig, J., 'The devastating impact of Trump's slashing foreign aid, in 3 charts', *Vox*, 16 Mar. 2025; United Nations, 'US aid cuts will make world "less healthy, less safe and less prosperous": Guterres', UN News, 28 Feb. 2025; and Pannell, A., 'USAID suspension shutters Colombia programs, endangering FARC peace deal', Reuters, 18 Mar. 2025.

[20] Dyvik, E. H., 'Number of nuclear warheads worldwide from 1945 to 2024', Statista, 4 July 2024; and Kristensen, H. M. and Norris, R. S., 'Global nuclear weapons inventories, 1945–2013', *Bulletin of the Atomic Scientists*, vol. 69, no. 5 (2013). On the numbers at the start of 2025 see chapter 6 in this volume.

[21] See *SIPRI Yearbook 2019*, chapter 1, pp 4–9.

Reduction Treaty (New START), agreed in 2010 and entering force in 2011, with a ten-year duration, extendable by five years upon mutual agreement.[22] Having been extended by presidents Biden and Putin within days of the former's inauguration in 2021, it is set to expire in early 2026. There is no sign of negotiations to renew or replace it, and no sign on either side of wanting to do so. President Putin suspended Russia's participation in the treaty in February 2023, though he affirmed that Russia would continue to abide by the treaty's numerical limits.[23] For his part, President Trump has long regarded New START as 'one-sided' and 'just another bad deal that the country made'.[24] This does not necessarily mean the end of arms control between Russia and the USA, but it does suggest that, if it is to persist, there may be a change in its terms.

The first Trump administration's firm policy was that China should join in and make bilateral arms control trilateral; in vague terms, the president has reaffirmed this view since his inauguration.[25] There is something to be said for that while China's nuclear arsenal enlarges, but it will likely make eventual negotiations more difficult: the geometry of a balanced agreement between two sides is complex enough; between three, it becomes fiendish. The USA is unlikely to let its nuclear arsenal be seriously outweighed by the combined total of two countries it regards as adversaries. China and Russia, however, will probably refuse to be treated as a single or combined entity for the purposes of agreement, or allow themselves individually to be significantly outweighed by the USA.

The obvious precedent is the 1922 Five-Power Naval Limitation Treaty that set limits on the total tonnage of capital ships in the world's five major navies.[26] The limits were, approximately, 500 000 tons standard displacement each for the United Kingdom and the USA, understood as global powers; 300 000 for Japan; and about 200 000 tons each for France and Italy. Though it is a precedent, the historical parallel is limited since the five powers were post-war allies and victors. The current three great powers have a complex mix of competitive and cooperative interactions: one dyad is clearly adversarial (China–USA); one is alternatingly adversarial and cooperative within

[22] Arms Control Association, 'New START at a glance', Fact sheet, Dec. 2024. See also annex A, section III, in this volume.

[23] Putin, V., Presidential address to the Russian Federal Assembly, Moscow, 21 Feb. 2023.

[24] Holland, S., 'Trump wants to make sure US nuclear arsenal at "top of the pack"', Reuters, 24 Feb. 2017.

[25] Miller, Z. and Price, M. L., 'Trump wants denuclearization talks with Russia and China, hopes for defense spending cuts,' AP, 14 Feb 2025.

[26] US Department of State, Office of the Historian, 'The Washington Naval Conference, 1921–1922', Milestones 1921–1936, [n.d.]; and 'Five-Power Naval Limitation Treaty', *Britannica*, 30 Jan. 2025.

limits (Russia–USA); and one is predominantly cooperative but with clear divergences of agenda, standing and trajectory (China–Russia).[27]

Even if a trilateral geometry could be worked out, it begs the question, what about the others—Britain and France, India and Pakistan, Israel, and North Korea? Russia might argue that French and UK nuclear capacities should be counted alongside the USA's in assessing strategic balance. It is not inconceivable that the USA might argue likewise about North Korea, and China about India, which would draw Pakistan's force into the discussion. Meanwhile, Israel's nuclear capacity is identified as a major problem for regional peace and security by the Arab states and Iran, with whom the great powers are variously seeking good relations.

Further, while some of the transatlantic heat of early 2025 may dissipate, the idea of a more European role for French nuclear forces has been mooted.[28] In principle, similar thoughts could be entertained about the UK's nuclear force. However, the UK's capacity is wholly dependent on the USA for maintenance and support.[29] This would make it difficult to establish a clear declaratory doctrine to underpin credible support for European strategic autonomy. By contrast, the French nuclear force is genuinely independent—a French capacity for French purposes. That is an obstacle to Europeanizing the force's role but, if it could be set aside, credible political and strategic signalling could ensue. Any such change would depend on internal French politics and not least on the outcome of the presidential election in 2027. Were it to transpire, it would turn up the heat of disputations within the North Atlantic Treaty Organization and probably add further twists to the geometry of nuclear arms control.

The reluctance of the states that own nuclear weapons to commit themselves to further nuclear arms reductions has long been generating impatience and frustration among many of the strongest advocates for nuclear non-proliferation and disarmament. Successive review conferences of the Nuclear Non-Proliferation Treaty seem only to produce disagreement over disarmament.[30] The big question is, when will that process reach breaking point? Since the end of the cold war in 1989–91, three new states have gone nuclear: India, Pakistan and North Korea. Compared to worries in the 1970s that there could be many more states with nuclear weapons within a relatively short period, three additional states going nuclear counts as a relative success for the non-proliferation regime. But revitalized national debates in Europe, the

[27] On the tendency among politicians and commentators in the West to homogenize the relationship between China and Russia see Smith, D., 'Introduction: International stability and human security in 2022', *SIPRI Yearbook 2023*, pp. 8–10.

[28] 'Europe thinks the unthinkable on a nuclear bomb', *The Economist*, 12 Mar. 2025.

[29] Messmer, M. and O'Sullivan, O., 'The UK's nuclear deterrent relies on US support—but there are no other easy alternatives', Chatham House, 24 Mar. 2025.

[30] On the 1968 Treaty on the Non-Proliferation of Nuclear Weapons see annex A, section I, in this volume.

Middle East and Northeast Asia about nuclear status and strategy suggest there is some potential for more states to join the nuclear club.[31]

III. A new nuclear arms race?

The signs are that a new nuclear arms race is gearing up. Compared to the last one, the risks are likely to be more diverse and more serious.[32] Among the key points of competition will be technological capacities in cyberspace, outer space and ocean space. Thus, the arms race may be more qualitative rather than quantitative, and the idea of who is *ahead* in the race will be even more elusive and intangible than it was last time round. In this context, the old largely numerical formulas of arms control will no longer suffice.

Quantum technologies will likely have a major impact on cryptography standards, and thus on the security of a range of communication systems, while also enabling new methods of global observation and monitoring.[33] It is too early to be sure about the full impact of quantum technologies but some clarity is emerging. For example, until now, the working assumption has been that, since nuclear-powered submarines have the whole ocean to hide in, they are effectively invulnerable. Thus, submarine-launched ballistic missiles would always be available for use in the last resort, and were therefore a fail-safe deterrent that would ensure the last resort would never be arrived at. But quantum observation and detection technology could make finding submarines in the ocean depths less difficult, which, if so, would be a new source of instability.[34]

The same is true of missile defence. A pipe dream in 1983 when US President Ronald Reagan launched the Strategic Defense Initiative, widely derided as Star Wars, many now see it as a realistic prospect.[35] Consequently, it has become a terrain of great power competition.[36] While the USA is generally seen as currently having an advantage, China and Russia are also

[31] See, e.g. Cienski, J. and Kość, W., 'Poland seeks access to nuclear arms and looks to build half-million-man army', *Politico*, 7 Mar. 2025; Chang, G. G., 'Japan's new leader wants nuclear weapons', *Newsweek*, 13 Oct. 2024; and Borger, J., 'Crown prince confirms Saudi Arabia will seek nuclear arsenal if Iran develops one', *The Guardian*, 21 Sep. 2023.

[32] See Mathews, J. T., 'The race that can't be won', *New York Review*, 17 Oct. 2024.

[33] Blanchard, A., 'Look before we leap: Peace, security and the second quantum revolution', SIPRI Commentary, 7 Nov. 2024; and 'Quantum's impact on cyber security', Viva Technology, 20 Jan. 2025.

[34] Roblin, S., 'New "quantum sensors" could make America's billion-dollar submarines obsolete', *Popular Mechanics*, 30 Jan. 2025.

[35] Reagan, R., 'Address to the nation on defense and national security', 23 Mar. 1983, Ronald Reagan Presidential Library and Museum; and Stares, P. and Pike, J., 'The "Star Wars" initiative: Problems and prospects', *Space Policy*, vol. 1, no. 2 (May 1985).

[36] Zhao, T. and Stefanovich, D., *Missile Defense and the Strategic Relationship among the United States, Russia, and China* (American Academy of Arts and Sciences: Cambridge, MA, 2023); and Soofer, R. et al., *'First, we will defend the homeland': The Case for Homeland Missile Defense* (Atlantic Council: Washington, DC, 4 Jan. 2025).

attempting to develop significant capabilities.[37] The degree to which such defence systems could be effective against various long-range missile attack scenarios has not, of course, been tested in real-world situations, thankfully. There remains, therefore, room for caution about the more ambitious claims of their effectiveness.[38]

The USA's rationale for investing in missile defence has shifted over the years. In Reagan's initial outline of the proposal, the rationale was summed up in his question, 'What if free people could live secure in the knowledge that their security did not rest upon the threat of instant US retaliation to deter a Soviet attack, that we could intercept and destroy strategic ballistic missiles before they reached our own soil or that of our allies?'[39] The dream, however, far outstripped the technology. As the prospect became more realistic in the past decade, missile defence was primarily assessed by US authorities for its utility in defending against attacks from states regarded as 'rogue', such as Iran and North Korea; this was the approach under both the first Trump administration (2017–20) and the Biden administration (2021–24).[40] The overall posture thus combines deterrence by retaliation against attacks by China and Russia, with deterrence by denial of (i.e. effective defence against) smaller forces that pose lesser tasks for missile defence. The second Trump administration, however, has moved beyond previous doctrine. Making explicit reference to President Reagan's original vision, it has ordered the development of 'a next-generation missile defense shield' so that, as well as deterring attack, the USA can 'defend its citizens and critical infrastructure' against 'any foreign aerial attack on the Homeland'.[41] In a nod to Israel's defence system against short-range missile attack, the planned US homeland defence system was initially called the Iron Dome; later, it was upgraded to Golden Dome.[42]

The problem with strategic missile defence is that, if it works, it is the anti-nuclear shield that allows the one who bears it to wield the nuclear sword. In strategic theory, the effective shield means the one who has it is not constrained by deterrence. Inevitably, the prospect of missile defence is encouraging investment in technologies to circumvent it.

[37] Mezey, J., 'Russian and Chinese strategic missile defense: Doctrine, capabilities, and development', Atlantic Council Issue Brief, 10 Sep. 2024; and US Department of Defense (DOD), 'Foreign nations' missile defense systems', Missile Defense Review fact sheet, 17 Jan. 2019.

[38] Arms Control Association, 'Current US missile defense programs at a glance', Fact sheet, Jan. 2025.

[39] Reagan (note 35).

[40] US DOD, *2019 Missile Defense Review* (DOD: Washington, DC, 2019), p. v; US DOD, *2022 National Defense Strategy of the United States of America* (DOD: Washington, DC, Oct. 2022), p. 10; and US DOD, *2022 Missile Defense Review* (DOD: Washington, DC, Oct. 2022), pp. 5–6.

[41] White House, 'The Iron Dome for America', Presidential Action, 27 Jan. 2025.

[42] Harpley, U. L., 'Space Force leaders start work on Golden Dome see massive effort ahead', *Air & Space Forces Magazine*, 6 Mar. 2025.

One component of the coming arms race will be the attempt to gain and maintain a competitive edge in artificial intelligence (AI), both for offensive and defensive purposes. AI has a wide range of potential strategic utility; there are benefits to be found but the careless adoption of AI could significantly increase nuclear risk.[43] The key to understanding this is AI's capacity to handle huge amounts of data quickly. Quantum technologies may also be part of this story. These technologies could contribute to arms control by strengthening the capacity to monitor compliance with any agreements that are reached. But as the new technologies speed up decision making in crisis, there is also the risk of a war as a result of miscommunication, misunderstanding or even a technical accident.

Eighty years into the nuclear age, it remains the case that there are no credible circumstances in which it makes rational sense to launch a nuclear war, even if facing defeat in a conventional war. To do so would be an obvious act of self-destruction, even if missile defence makes further advances, even if nuclear submarines can be found more easily than they can today, and even if one side thinks it has a comprehensive technological advantage. But the risk of a nuclear war occurring inadvertently persists, bringing to mind scenarios in which, perhaps, the ill-luck of a technical glitch is compounded by human fallibility against a background of hostility and mutual suspicion.

That risk was real enough in September 1983 when information about five missiles launched from the USA and targeted at the Soviet Union appeared on a Soviet officer's computer screen. It was a time of heightened tension, only a few weeks after Soviet air defence shot down a Korean airliner that had strayed into restricted Soviet airspace.[44] Humanity was saved from nuclear catastrophe because the officer, Lieutenant Colonel Stanislav Petrov, did not fully trust the early warning software and thought a nuclear strike with just five missiles was illogical.[45] Had he believed the information, he would have passed it up the line and, though there is no certainty either way, his superiors, wrongly thinking they were under attack, might have decided upon retaliation. The challenging questions for nuclear risk estimation today include assessing whether future Petrovs and their superiors will have time and opportunity to decide. Given the emphasis on speed, will they have a place in the decision process?[46]

[43] Boulanin, V. et al., *Artificial Intelligence, Strategic Stability and Nuclear Risk* (SIPRI: Stockholm, June 2020); and Chernavskikh, V., 'Nuclear weapons and artificial intelligence: Technological promises and practical realities', SIPRI Background Paper, Sep. 2024.

[44] 'The downing of KAL flight 007', Association for Diplomatic Studies and Training, 2025.

[45] Mathews, D., '41 years ago today, one man saved us from world-ending nuclear war', *Vox*, 26 Sep. 2024; and 'Stanislav Petrov', *Wikipedia*, accessed 12 Mar. 2025.

[46] O'Hanlon, M. E., 'How unchecked AI could trigger a nuclear war', Brookings Commentary, 28 Feb. 2025.

IV. World order

The troubling condition of the world order constitutes part of today's nuclear challenge.[47] World order can be defined in general theoretical terms as the way in which international relations are arranged through institutions, treaties, laws and norms. Looked at more closely, the whole can be broken down into a set of different orders dealing with economic relations, questions of peace and security, the natural environment, human rights, health, cultural heritage and more. Some aspects of order are formalized, some not; some are more or less universally acknowledged, some not. As a result of this diversity of forms and acceptance, the commonly used terminology in the West that refers to 'the rules-based international order' (or a close variant of that vocabulary) can be misleading.[48] That said, there are nonetheless institutions to which states have committed themselves, treaties and laws by which they have undertaken to abide, and norms that command general if not comprehensive support.

Looking at the work of global institutions in terms of the requirements of international stability and human security, it is distressingly clear that they are currently unable to achieve disarmament, manage conflict or handle the ecological crisis. Neither the UN and its various agencies, nor regional organizations like the African Union, nor the international financial institutions like the World Bank, nor the great powers and their alliances are handling these major, epoch-defining challenges well.

Global military spending has increased every year for the past decade and in 2024 exceeded 2.7 trillion US dollars.[49] High as this figure looks, the global economic burden of military spending is not exceptionally large by historical standards. In 2024 military spending took up 2.5 per cent of global GDP; a World Bank estimate using SIPRI data indicates that the comparable figures were 5.4 percent in 1964 and 4.2 percent in 1984.[50] This suggests that, though adjusting state budgets may be politically contentious with negative social effects as other needs go unmet, it would be unwise to assume that military spending has peaked. Indeed, in early 2025 European states announced plans for further, major increases in military expenditure.[51]

[47] See also Smith, D., 'International stability and human security in 2023', *SIPRI Yearbook 2024* (note 5).

[48] Chalmers, M., 'Which rules? Why there is no single "rules-based international system"', Royal United Services Institute (RUSI) Occasional Paper, Apr. 2019.

[49] See chapter 3 in this volume.

[50] See chapter 3, table 3.2 in this volume; and World Bank Group, 'Military expenditure (% of GDP)', [n.d.], <https://data.worldbank.org/indicator/MS.MIL.XPND.GD.ZS>, accessed 12 Mar. 2025.

[51] Rankin, J., ' "Watershed moment": EU leaders agree plan for huge rise in defence spending', *The Guardian*, 6 Mar. 2025.

The high number of armed conflicts today is a key marker of a deteriorating security horizon and deficient world order.[52] Among them is Russia's war in Ukraine since 2014, which drastically escalated in February 2022. The war is a clear violation of the UN Charter, Article 2 of which binds member states to 'settle their international disputes by peaceful means' and 'refrain in their international relations from the threat or use of force against the territorial integrity or political independence of any state'.[53] The human toll of this and other wars—the most violent being those in Ethiopia, Gaza, Myanmar and Sudan—continues to climb, though data on war deaths is, as always, unclear. Estimates of Ukrainian war deaths by independent observers range from 70 000 to 100 000, while on the Russian side some estimates go above 150 000 battlefield deaths.[54] This war, in which approximately 250 000 Ukrainian troops confront about 400 000 Russian and 11 000 North Korean troops along a front line of some 1600 kilometres, with intense activity throughout but very little change in the front lines since late 2022, is very different from most other current armed conflicts.[55] More typical is the less structured violence of the wars in Ethiopia, Myanmar and Sudan. During 2024, wars had increased the number of displaced Ethiopians to 4.5 million, expelled 1 million Rohingya into Bangladesh from Myanmar, while displacing over 3 million people inside Myanmar, and forcibly displaced close to 13 million Sudanese.[56] And in another different kind of war, Israel's land and air offensives on Gaza since the Hamas invasion in October 2023 had resulted (at the end of 2024) in a death toll reported as some 45 500 people by Palestinian sources, but as at least 64 000 people by June 2024 in a study published by *The Lancet* medical journal.[57] Israel's offensives also displaced over 1.9 million people, 90 per cent of Gaza's population, by the end of 2024.[58] Israeli attacks on targets in Gaza have continued despite the International Court of Justice ordering it to stop in May 2024, and despite the ceasefire agreed in

[52] See chapter 2 in this volume; and Uppsala Conflict Data Programme.

[53] United Nations, 'United Nations Charter (full text)'.

[54] Kurmanaev, A. and Méheut, C., 'Ukraine is losing fewer soldiers than Russia—but it's still losing the war', *New York Times*, 23 Jan. 2025; and Mappes, G., 'Russia has failed to break Ukraine', Institute for the Study of War, Feb. 2025.

[55] See the Russian Offensive Campaign Assessment series by the Institute for the Study of War; and 'Ukraine in maps: Tracking the war with Russia', BBC, 13 Mar. 2025.

[56] OCHA, 'Ethiopia: Internal displacement overview', June 2024; UN High Commissioner for Refugees (UNHCR), 'Myanmar situation', Situation Overview, 2025; and UNHCR, Refugee Data Finder, 'Annex 2—Populations protected and/or assisted by UNHCR by country/territory of origin', 2024.

[57] Jamaluddine, Z. et al., 'Traumatic injury mortality in the Gaza Strip from Oct 7, 2023, to June 30, 2024: A capture–recapture analysis', *The Lancet*, vol. 405, no. 0477 (8 Feb. 2025).

[58] UN Relief and Works Agency for Palestine Refugees in the Near East (UNRWA), 'UNRWA Situation Report #162 on the humanitarian crisis in the Gaza Strip and the West Bank, including East Jerusalem', 9 Mar. 2025.

January 2025.[59] In these conflicts and others, two points in common stand out, perhaps especially when reviewing events in the 75th anniversary year of the Geneva Conventions that form the core of international humanitarian law: human suffering and the extreme difficulty for global institutions to do anything about it.[60]

Setting the context for this discussion and offering a sense of perspective that is spurned by far too many politicians and opinion makers today, the ecological crisis continues to worsen. On 22 July 2024 the Earth experienced its warmest day since records began.[61] On some days in that month the temperature in the Antarctic winter was around 28°C warmer than normal.[62] Taking the year overall, 2024 was the warmest year on record.[63] The Paris Agreement of 2015 set the goal of limiting global warming to 'well below 2°C above pre-industrial levels' (defined as the period from 1850 to 1900), while trying to stay below a 1.5°C increase.[64] A decade later, 2024 is the first year on record in which the average global temperature was clearly more than 1.5°C above the pre-industrial average. The current trajectory of warming is towards approximately 3°C above the pre-industrial average.[65] Among the many distressing consequences of this is the increasing frequency of deadly humid heatwaves, with a combination of temperatures and humidity that the human physiology cannot survive.[66]

Climate change is but one part of the current ecological crisis. Some other dimensions of ecological disruption are on the international political agenda but the record is as questionable as it is on climate action. In November 2024 the Conference of Parties (COP) to the Convention on Biological Diversity failed to build properly on the agreement two years earlier—the Global Biodiversity Framework (GBF)—on radical measures to slow the loss of

[59] Application of the Convention on the Prevention and Punishment of the Crime of Genocide in the Gaza Strip (South Africa *v.* Israel), Order, 24 May 2024; and 'Israel kills over 150 Palestinians since ceasefire, including 40 in past two weeks: Gaza Media Office', *Middle East Monitor*, 15 Mar. 2025.

[60] On the Geneva Conventions see annex A, section I, in this volume; and International Committee of the Red Cross, 'The Geneva Conventions and their Commentaries', [n.d.]. On the 75th year of the conventions see Lloydd, M., 'The Geneva Conventions at 75: Do the laws of war still have a fighting chance in today's bloody world?', *The Conversation*, 12 Aug. 2025.

[61] European Commission, Copernicus Programme, 'New record daily global average temperature reached in July 2024', 25 July 2024.

[62] Gayle, D. and Noor, D., 'Antarctic temperatures rise 10C above average in near record heatwave', *The Guardian,* 1 Aug. 2024.

[63] European Commission, Copernicus Programme, *Global Climate Highlights 2024*, 2024 Annual Climate Summary, 10 Jan. 2025 (updated 17 Jan.).

[64] United Nations, Framework Convention on Climate Change, Paris Agreement, 2015, Article 2(a); and di Liberto, T., 'What's in a number? The meaning of the 1.5-C climate threshold', Climate.gov, 9 Jan. 2024.

[65] United Nations, Environment Programme (UNEP), *Emissions Gap Report 2024* (UNEP: Nairobi, Oct. 2024).

[66] Powis, C. M. et al., 'Observational and model evidence together support wide-spread exposure to noncompensable heat under continued global warming', *Science Advances*, vol. 9, no. 36 (Sep. 2023).

biodiversity and biomass.[67] At a February extension of the COP, some action was agreed on financing to support such measures but, whereas the GBF set targets to be achieved by 2030, a decision on a new fund will only be taken in 2028, if then.[68] An estimated 1 million species of animals and plants are threatened with extinction; this may be close to one-eighth of all species on the planet. This has potentially profound consequences for health and food security.[69] Similarly challenging for food security, a recent study revealed how microplastics hinder photosynthesis in plants, with the identifiable effect of severely reducing food production.[70] Appropriately, plastics pollution has received international political attention; in March 2022, the UN Environment Assembly agreed to develop a legally binding international instrument on plastic pollution by the end of 2024.[71] The deadline came and went, however, without agreement on what targets and what bans on specific chemicals and plastics could be included in the treaty text.[72] Some issues are well established on the scientific agenda and equally serious, yet have no political platform for discussion and possible action. One example is antimicrobial resistance (AMR). It is estimated that antibacterial resistance, a subset of AMR, is likely to contribute to 10 million premature deaths annually by 2050, and will lengthen recovery times from illnesses that, since the large-scale manufacture and provision of penicillin and other antibiotics, have been rather straightforward to treat.[73] Another example is air pollution, which, according to the World Health Organization, affects well over 90 per

[67] UNEP, Conference of the Parties to the Convention on Biological Diversity, 15th Meeting pt II, 'Kunming–Montreal Global biodiversity framework', CBD/COP/15/L.25, 18 Dec. 2022; and Greenfield, P. and Weston, P., 'COP16 ends in disarray and indecision despite biodiversity breakthroughs', *The Guardian*, 3 Nov. 2024.

[68] Chandrasekhar, A. et al., 'COP16: Key outcomes achieved at the resumed UN biodiversity conference in Rome', *Carbon Brief*, 28 Feb. 2025; and Weston, P., 'COP16 nature summit agrees deal at 11th hour but critics say it is not enough', *The Guardian*, 28 Feb. 2025.

[69] Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), *Global Assessment Report on Biodiversity and Ecosystem Services* (IPBES: Bonn, 2019); and Mora, C. et al., 'How many species are there on earth and in the ocean?', *PLoS Biology*, vol. 9, no. 8 (Aug. 2011).

[70] Zhu, R. et al., 'A global estimate of multiecosystem photosynthesis losses under microplastic pollution', *Proceedings of the National Academy of Sciences*, vol. 122, no. 11 (10 Mar. 2025), e2423957122.

[71] UNEP Environment Assembly, Resolution 5/14, 2 Mar. 2022.

[72] European Commission, Directorate-General for Environment, 'EU regrets lack of conclusion on global plastics agreement', 2 Dec. 2024.

[73] O'Neill, J. et al., *Tackling Drug-Resistant Infections Globally: Final Report and Recommendations* (Review on Antimicrobial Resistance: London, 2016); World Health Organization (WHO), 'Antimicrobial resistance', 21 Nov. 2023; and Naghavi, M. et al., 'Global burden of bacterial antimicrobial resistance 1990–2021: A systematic analysis with forecasts to 2050', *The Lancet*, vol. 404, no. 10459 (2024).

cent of the world's population; robust research links it to increased aggression among children and to violent crime.[74]

The natural foundations on which all social and economic life is based are changing and weakening. Though all the connections and interactions have not yet been identified, it is clear that this has profoundly concerning implications for peace and security.[75] Choosing viable modes of response to this challenge will both influence and be shaped by geopolitical alignments. In particular, it will interact with choice about where governments position themselves on the spectrum between all-out international cooperation and throwing up the barriers against all comers.

V. Facing the challenge

There are clear deficiencies in the international efforts to address the problems outlined in this chapter and, indeed, other problems not discussed here such as pandemic risk, the regulation of cyberspace and the free flow of world trade.[76] These deficiencies are not the product of recent events alone for they have been unfolding for at least two decades and have deep roots. With President Trump's return to the White House, there is a repeat of the paradoxical situation experienced during his first administration, in which none of the three great powers is committed to defending and upholding the world order. China as the rising power, Russia as the declining power and the USA as, under Trump, a profoundly disaffected power, all seek freedom from the constraints of agreed rules whenever they are inconvenient.

In these circumstances, it seems that the medium and small powers have the greater interest in sticking to an agreed order and making it work for them, despite its flaws. Their main structural alternative is to ally closely with one great power and follow its lead. Some governments will find that path viable but for many it will involve sacrificing important priorities and principles, such as action on climate change and fidelity to the rule of law. For them, the better choice is to work together in coalitions with like-minded governments on specific goals.

The emphasis on cooperation to solve shared problems offers a normative constraint to underpin world order and generates a platform that is conducive

[74] WHO, 'Air quality database: Update 2022', 2022; Reuben, A. et al., 'Association of air pollution exposure in childhood and adolescence with psychopathology at the transition to adulthood', *JAMA Network Open*, vol. 4, no. 4. (2021); Burkhardt, J. et al., 'The effect of pollution on crime: Evidence from data on particulate matter and ozone', *Journal of Environmental Economics and Management*, vol. 98 (Nov. 2019) 102267; and Bondy, M., Roth, S. and Seger, L., 'Crime is in the air: The contemporaneous relationship between air pollution and crime', *Journal of the Association of Environmental and Resource Economists*, vol. 7, no. 3 (2020).

[75] Schoonover, R. and Smith, D., 'Five urgent questions on ecological insecurity', SIPRI Insights on Peace and Security No. 2023/05, Apr. 2023.

[76] On the regulation of cyberspace see chapter 13, section III, in this volume.

to dialogue, compromise and agreement. This is beyond the capacities of the three great powers, all of whose diplomacy involves too much shouting and too little listening.

Part of today's problem is that inconsistencies among many ostensible defenders of international order in the past two to three decades have not only generated clear cases of double standards—concerning war crimes and violations of national sovereignty, most notably—they have also emboldened governments that object to general norms. The emboldened disruptor is, furthermore, empowered by the insistence in many global institutions that agreement and action require consensus support. This gives too much power to the stand-outs. It is among the key reasons for the failure to make progress on climate change, biodiversity and plastics pollution, referenced above. Yet there are issues on which consensus can safely be jettisoned. Climate change is among them because if the biggest emitters curb their emissions, global warming will start to slow. Were China and the EU to agree radical measures to mitigate greenhouse gas emissions, others would come on board and the 2°C Paris target would start to become realistic.

In short, cooperation is of value even when it is not comprehensive. It is a pragmatic, viable approach: the new realism.[77] Without it, a genuine, lasting worldwide security is not possible. Among the small and medium powers, almost all recognize some issues on which cooperation is key, though they may not all agree on everything. Coalitions may vary issue by issue, possibly leading to what has been called a multiplex world order: diverse, composed of distinct, interleaved parts, with different states having different degrees of influence over different issues.[78]

It is, however, unlikely that a multiplex or small- and medium-power approach to nuclear arms control is likely to renew the historic reduction of the global nuclear arsenal. That can only happen if the three great powers agree on it. The increased tensions, conflicts, insecurity and uncertainties that characterize the present decade seem likely to persist, which ought to underline the importance of further nuclear reductions. Without them, the spectre of renewed nuclear proliferation may arise and, with or without it, the adoption of new generations of conventional weapons. In short, if the diplomacy of the arms control track cannot be revived, an accelerating arms build-up is all the more likely.

There are, perhaps, two tracks to follow here. One is to acknowledge that President Trump has signalled repeatedly in the first few weeks of his new administration that he seeks agreement on nuclear reductions with China

[77] Axelrod, R., *The Evolution of Cooperation* (Basic Books: Cambridge, MA, 1984/2006).

[78] Acharya, A., Estevadeordal, A. and Goodman, L. W., 'Multipolar or multiplex? Interaction capacity, global cooperation and world order', *International Affairs*, vol. 99, no. 6 (Nov. 2023).

and Russia.[79] While there is some puzzlement from more than one side of the expert community on what the president means and why, it ought to be recognized that by asserting his preference so strongly, President Trump may actually succeed in opening up the bi/tri/multilateral arms control agenda.[80] He may try and fail, or he may not really mean it, or he may only mean it in a way that is wholly indigestible for Chinese and Russian leaders. But the possibility that it is genuine should not be regarded as *a priori* out of the question.

The second track is to focus on the public dimension and especially on the question of public information and understanding of the risks inherent in the existence and possession of nuclear weapons. For 35 years since the end of the cold war, the nuclear threat has receded from public awareness. In the rich countries, for the generations known as 'Boomers' and 'Generation X', growing up in the 1950–60s and the 1970–80s, respectively, nuclear anxieties were close at hand. For 'Millennials' and 'Gen Z', for good reasons the worries were much less pressing. Now, there needs to be a new, general understanding that nuclear weapons do not buy security and their existence demands balanced behaviour by political leaders. There also needs to be more training for diplomats in matters of nuclear arms control. This can make possible initial small steps towards reducing risk: hotlines, transparency, even informal understandings and formal agreements, such as no first use of nuclear weapons and nuclear-weapon-free zones. These will form guardrails against disaster. Together with the voices of an informed public, they could also be part of building the pressure for the three great powers to take the next steps in reducing their nuclear arsenals.

[79] Palmer, E., 'Donald Trump provides nuclear weapons update', *Newsweek*, 24 Jan. 2025; Herman, S., 'Trump support for denuclearization talks with Russia, China raises hopes', Voice of America, 31 Jan. 2025; and English, E., 'Trump wants to initiate denuclearization talks with Russia and China', *Bulletin of the Atomic Scientists*, 14 Feb. 2025.

[80] Balzer, K., 'Trump's "denuclearization" is a nonstarter—but there is a future for arms control', American Enterprise Institute (AEI) AEIdeas Blog, 14 Feb. 2025; and Kimball, D. G., 'Making sense of Trump's talk of "denuclearization"', *Arms Control Today*, Mar. 2025.