**Baltics Aff**

**Solvency---Hedgehog**

**The plan solves.**

**Klein** et al. **19** [Colonel Robert M. Klein, Senior Military Fellow in the Center for Strategic Research (CSR), Institute for National Strategic Studies, at the National Defense University; Lieutenant Commander Stefan Lundqvist, Ph.D., Researcher and Faculty Board Member at the Swedish Defence University (SEDU); Colonel Ed Sumangil, USAF, Senior Military Fellow in CSR; Ulrica Pettersson, Ph.D., assigned to SEDU, Adjunct Faculty Member at Joint Special Operations University; 11-2019; "Baltics Left of Bang: The Role of NATO with Partners in Denial-Based Deterrence"; *Strategic Forum* 301, Institute for National Strategic Studies, National Defense University; https://inss.ndu.edu/Portals/68/Documents/stratforum/SF-301.pdf; KL]

To strengthen the military aspect of denial-based deterrence, NATO and partner forces must be equipped with robust A2/AD capabilities and postured in such a manner to limit Russian access and freedom of maneuver in the BSR and North Atlantic. Rather than position forces forward, NATO should consider keeping forces further back, taking advantage of strategic depth both to limit its vulnerability to Russian attack and increase operational flexibility. To make this posture credible, NATO should continue to invest in road and rail capacity and other transportation and **logistics infrastructure** in the BSR. NATO should enhance its cooperation with Sweden and Finland to include integrated planning to ensure plans are fully synchronized and readily executable. Furthermore, the Allies must prepare to fight in a contested battlespace to include the looming prospect, not seen since the end of the Cold War, of a nuclear confrontation.

The Alliance should invest in a **hedgehog defense** of the Baltic states, the most significant step of which is enhancing Total Defense through public education for resistance and then following through with the necessary commitment of resources in line with the concept. Estonia, Poland, Latvia, and Lithuania have already met or exceeded NATO’s 2 percent GDP benchmark for defense spending by individual countries.45 The Alliance should provide the **additional military assistance** required to bolster the Baltic states in their hedgehog defense to make **abundantly clear** to Moscow the high costs of any intervention. **Emerging technologies** increasingly benefit the defender, and NATO should make additional investments in **existing** technologies that can **revolutionize** the potency of frontline states’ hedgehog defenses, such as small warheads, 3D manufacturing, **drones**, task-specific **a**rtificial **i**ntelligence, robust **cyber** capabilities, and inexpensive **space** capabilities.46

NATO should continue **exercises**, like Trident Juncture held in the autumn of 2018, that demonstrate its **resolve**, **responsiveness**, and **operational reach**.47 These exercises should make it abundantly clear to Moscow that any Russian attack on the Baltics would be a **costly affair** and that Russian occupation of the Baltics would be untenable given NATO’s A2/AD capabilities undergirded by a tenacious hedgehog defense provided by the Baltic states themselves. Additionally, exercises should focus on **allied interoperability** and **command and control** to ensure a rapid transition to a preplanned and prepared A2/ AD network of systems.

**The hedgehog solves.**

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A **more flexible** approach to defend the Baltics would be to augment denial-based deterrent strategies with threats of punishment. Denial-based deterrent strategies discourage enemy action by making it physically difficult for an adversary to coerce or attack.16 To execute deter by denial, the defender must demonstrate that enemy leaders cannot achieve their aims at acceptable costs. Although no concept of defense in the Baltics can eliminate the risks of escalation with absolute certainty, denial-based deterrence offers a way to mitigate them. Area denial is often thought of as an operational concept used by U.S. adversaries to prevent freedom of action in a geographical zone under the enemy’s direct control. However, area denial can work both ways. To best protect its Baltic partners, NATO should use **strategic depth** to its advantage by establishing its own A2/ AD bubble over the region. A denial-based deterrence strategy in the Baltic region would encompass a wide range of capabilities: deploying integrated air and missile defenses, establishing sea denial, and investment in popular mobilization leveraging creative and cost-effective approaches to attrit the elements of any Russian military advance.

Carl von Clausewitz recognized that the aim of defeating the enemy “can, in practice, be replaced by two other grounds for making peace: the first is the improbability of victory; the second is its unacceptable costs.”17 He also reasoned that “the defense is the stronger form of waging war. . . . [I]f attack were the stronger form, there would be no case for using the defense.” 18 In Clausewitz’s mind, the purpose of defense was preservation of combat power. The defender also had the advantage of position. Area denial for the Baltics would have NATO blunt the strategic effectiveness of Russian attacks. Demonstrating the capability to impose costs and make the victory seem improbable could shift Russia’s cost-benefit analysis enough to deter attack. If not, the escalating costs of continued Russian military action in a prestructured and in-depth NATO Baltics A2/ AD complex could increase the improbability of achieving Moscow’s main political aims and open the political space for negotiation.19

NATO enjoys several natural geographic advantages that enable a denial-based deterrent strategy based on an AD operational concept. In particular, the geography of the Baltic Sea favors a **defensive** operational concept because of its relatively small size and shallow depth, with only a few navigable passageways and numerous **chokepoints**. Approximately half of Russia’s maritime cargo transits through the Baltic Sea, thereby providing NATO and its partners economic leverage in a potential crisis.20 By extension, NATO should plan to deny Russia access to the North Atlantic via the GIUK (Greenland–Iceland– United Kingdom) Gap and further afield to the Barents Sea between Svalbard and Norway’s northern coastline.

As mentioned, Russian forces stationed in the Kaliningrad exclave pose a particular predicament to NATO and its partners. Nevertheless, despite its menacing appearance, Kaliningrad may actually be a Russian vulnerability rather than a strength. Viewed as an encircled area, with the sea to the west and NATO surrounding the territory on the other three sides, Kaliningrad sits in a precariously vulnerable position, particularly given the array of A2/AD capabilities and strike capabilities that the Alliance and its partners could deploy against it. Therefore, a part of their deterrence strategy, NATO and its partners should demonstrate to the Russians their willingness and capability to neutralize and ultimately isolate Kaliningrad militarily in the event of a hot war scenario. Finally, the Alliance should be prepared to deny the airspace over the Baltics to Russian aircraft. One 2017 RAND study concluded, “From just two launch points, one in northeastern Poland and the other on one of the islands off the coast of Estonia, NATO forces could cover nearly the whole of the Baltic states, much of western Belarus, and all of Kaliningrad with suppression of enemy air defenses or counterbattery fires.”21 Given the above, even if Russia were to launch an invasion of Estonia, Latvia, or Lithuania, NATO’s goal would be to impose high costs and, should that fail, render any subsequent Russian occupation untenable.

The ability of NATO to maintain a Baltics defense coalition hinges on **perception**s of Russia’s aggressive behavior, and Russia is more likely to be deterred if it perceives that **NATO solidarity** and the **preponderance** of international opinion and support siding with the Alliance. **Area denial** as an operational concept compares **favorably** to the alternatives if preservation of the NATO structure forms the basis for resolve. Foremost, it is a **defensive concept** that seeks to **preserve the status quo**, thereby allowing NATO to dominate the **strategic narrative** by playing to international perceptions of **legitimacy** based on the right to **self-defense** and freedom of the global commons. Because area denial is defensive in nature, it is more **palatable** to NATO and its partners than offensive-minded concepts, particularly when compared to provocative and expansive actions that could horizontally expand military operations deep into Russian territory or to other geographic regions.

The same **technologies** that enable Russia’s A2/ AD capability are proliferating to Russia’s NATO and NATO-aligned neighbors, making area denial **extremely attractive** from a practical standpoint. Several states in the region—including Sweden and Poland—already possess high-end A2/AD capabilities and are either affiliated with NATO or members of the Alliance. These capabilities include long-range **precision-strike** systems, such as **GPS-guided** cruise and ballistic missiles; littoral anti-ship capabilities (high-quality nonnuclear submarines, fast missile-armed surface craft, and smart coastal and shallow-water mines); both long- and short-range air defenses; long-range **precision-guided** artillery and rocket systems; and **cyber** and **electronic** warfare capabilities.22 Militarily, the combination of NATO AD capabilities should provide its own deterrent effect, just as NATO forces did in Western Europe during the Cold War. Unfortunately, NATO and partner nations currently are “almost completely dependent on airpower” to counter Russia’s extensive array of A2/AD capabilities, according to General Philip Breedlove, former NATO Supreme Allied Commander, Europe, in a 2016 speech.23 Notably, the use of fighters such as the F-35 would be problematic in a Baltics scenario given its short range and the F-35’s dependence on air refueling.24

The NATO goal should be to **knit partners together** in a networked system of **advanced** command, control, communications, computers, intelligence, surveillance, and reconnaissance (**C4ISR**), **targeting**, **p**recision-**g**uided **m**unitions, **airborne early warning** capabilities, **integrated air defenses**, **m**aritime **d**omain **a**wareness, **undersea surveillance**, and standoff capabilities such as cruise and ballistic missiles. This networked system-of-systems approach has come to define the contemporary revolution in military affairs. Policy analysts James Thomas and Evan Montgomery have dubbed these “mini A2/ AD complexes.”25 The current willingness of key Allies and partners—particularly those in the Baltic region—to modernize their militaries makes it a favorable time for NATO to implement such a defensive concept. Therefore, providing partners with additional enabling capabilities to round out their defensive formations may prove critical. To enhance area denial, NATO needs additional mobile and survivable long-range precision-strike capabilities such as the Army Tactical Missile System (ATACMS) and Highly Mobile Artillery Rocket System. The Army is currently developing DeepStrike, a next-generation missile for these systems that doubles the firepower and can engage targets at distances up to 499 km, including the ability to hit moving targets on land and at sea.26 To counter Russian tactical missiles, cruise missiles, drones, and advanced aircraft, additional NATO and partner countries should procure the Patriot and other surface-to-air missile defense systems.

**The hedgehog’s signal deters Russia.**

**Klein** et al. **19** [Colonel Robert M. Klein, Senior Military Fellow in the Center for Strategic Research (CSR), Institute for National Strategic Studies, at the National Defense University; Lieutenant Commander Stefan Lundqvist, Ph.D., Researcher and Faculty Board Member at the Swedish Defence University (SEDU); Colonel Ed Sumangil, USAF, Senior Military Fellow in CSR; Ulrica Pettersson, Ph.D., assigned to SEDU, Adjunct Faculty Member at Joint Special Operations University; 11-2019; "Baltics Left of Bang: The Role of NATO with Partners in Denial-Based Deterrence"; *Strategic Forum* 301, Institute for National Strategic Studies, National Defense University; https://inss.ndu.edu/Portals/68/Documents/stratforum/SF-301.pdf; KL]

In short, the **best course** of defense for the Baltic states is to adopt the strategy of the **hedgehog**—the hedgehog does not defend against the predator by trying to emulate the predator’s strengths (speed, claws, and teeth) but puts on such a defensive display that the predator decides to leave it alone. The predator also realizes that should it be successful in breaking through the hedgehog’s defenses, the hedgehog would prove even more difficult for the predator to swallow and digest. Switzerland is a classic example of the hedgehog or “bitter pill” strategy.40 An astute European aphorism over the years has been, “Switzerland doesn’t have an army; Switzerland is an army.”41 The Finns have fostered a similar reputation by standing up to the Soviet Union during the Winter War and Continuation War.42 Nevertheless, the **defensive display** of the hedgehog is far **more important** than actual defense. Frontline hedgehog states must demonstrate their defensive capabilities as part of an **active information** campaign and as a **policy tool**.43

The hedgehog strategy should **underpin** NATO’s denial-based deterrence strategy in the BSR. It dispels any notions Russia may have of getting away with an easy victory by increasing the immediate costs of grabbing territory. As additional components of the strategy, NATO must have plans and organizations for defending the Baltic states and Poland, reinforcing Alliance forces in the Artic and GIUK Gap, and establishing A2/AD bubbles over the region. More important, based on those plans, **NATO** must convey to the Russians its level of **preparedness** and **intent**, including the potential costs to Russia should it decide to threaten NATO or its partners.44 If properly implemented, NATO’s denial-based deterrence strategy should change Moscow’s **decision calculus** regarding a quick territorial land grab of the Baltics. Instead, NATO deters Russia by making the Baltics more difficult for Russia to invade and occupy and by prospect of inflicting unacceptable costs on Russia both at the immediate onset of hostilities and over time through attrition.

**Deterrence prevents European war.**

**Graham 22** [Thomas Graham, PhD in political science from Harvard University, distinguished fellow at the Council on Foreign Relations. He is a cofounder of the Russian, East European, and Eurasian studies program at Yale University and sits on its faculty steering committee. He is also a research fellow at the MacMillan Center at Yale, Foreign Service officer for fourteen years. His assignments included two tours of duty at the U.S. Embassy in Moscow in the late Soviet period and in the middle of the 1990’s during which he served as head of the political internal unit and acting political counselor; 3-8-2022; “Preventing a **Wider** European Conflict”; *Contingency Planning Memorandum* No. 38, Council on Foreign Relations; <https://www.cfr.org/report/preventing-wider-european-conflict#:~:text=The%20Russian%20military%20intervention%20in,and%20further%20west%20into%20Europe>

Many of the steps that the Biden administration is now taking to counter Russia could be **accelerated** and **expanded** to **deter** it from expanding its military operations beyond that country. They would likely prove more effective due to NATO’s Article 5 collective defense guarantee, which does not apply to Ukraine. The Biden administration could:

* With its NATO allies, accelerate and expand its current **augmentation** of forces in vulnerable allies along the frontier with Russia to **reassure** them—and convince Moscow—of the alliance’s **commitment** to collective defense.
* Step up its already intensive schedule of **consultations** with allies to maintain **alliance unity** in the face of a burgeoning Russian threat.
* Develop a long-term plan to reduce Europe’s dependence on imported Russian gas, building on the stopgap measures it is already putting in place to deal with a near-term decision by Moscow to stop flows of gas westward.
* Consider cutting off energy imports from Russia, and asking the Europeans to do the same, but only after it has prepared the American public for the economic hardship (rising energy costs, inflation) such a step would entail.
* Accelerate efforts to harden American and **allied** **c**ritical **i**nfrastructure against **cyber intrusions**.

**Solvency---Security Cooperation**

**The plan solves. Durable, predictable, and sustainable US security cooperation through NATO wedded to cyber and AI boosts credibility, decision-making, and deterrence.**

**Lucas** et al. **22** [Edward Lucas, Non-resident Senior Fellow at the Center for European Policy Analysis (CEPA). He was formerly a senior editor at The Economist. Lucas has covered Central and Eastern European affairs since 1986, writing, broadcasting, and speaking on the politics, economics, and security of the region. A graduate of the London School of Economics and long-serving foreign correspondent in Berlin, Vienna, Moscow, and the Baltic states, he is an internationally recognized expert on espionage, subversion, the use and abuse of history, energy security and information warfare; Ben Hodges, previously held the Pershing Chair in Strategic Studies at the Center for European Policy Analysis; Carsten Schmiedl, Senior Program Officer in the Transatlantic Defense and Security Program. His interests include transatlantic relations, strategic culture, and the intersection of national security and emerging technology; 2-16-2022; "Close to the Wind: Recommendations for Baltic Sea Regional Security"; CEPA; https://cepa.org/close-to-the-wind-recommendations-for-baltic-sea-regional-security/; KL]

Improve Exercises

Improve the **scope**, **tempo**, and **depth** of **exercises** in the Baltic Sea region. Exercises should not be **showcase** events to demonstrate success, but to examine the causes of failure and improve capabilities. The overall goal should be **credibility**, internal and external: to show that the countries of the region are willing and able to defend themselves. This involves not only pure military capabilities but also psychological resilience, and deep integration of security policy in the wider society.

Key features of realistic exercises include:

* Surprise: Russian aggression could be sudden. The ability to mobilize a substantial part of fulltime and reserve forces in a short space of time, in an orderly and effective manner, in difficult conditions (including **rapid response** to **hybrid warfare**, such as **cyberattacks**), sends powerful messages to domestic and foreign audiences. Regional allies could follow this example by amending restrictions to legalize snap exercises and more frequently execute them.
* Disruption: Real war is no respecter of commuters’ schedules and property rights. Exercises involving “free play” will involve damage to crops, roads, buildings, and other infrastructure. They may make major roads impassable, sometimes at short notice, or involve the commandeering of facilities. Public messaging in advance of this, and adequate compensation afterwards, is an essential part of national security. NATO undertook such operations during the Cold War notably in what was then West Germany. It can do so again.
* Realistic scenarios: Exercise planners should factor in distractions and disruption, such as US commitments in the Indo-Pacific region, divisions that hamper EU and NATO decision-making, and other unexpected problems. As emphasized in transatlantic debates around NATO Allied Command Transformation’s (ACT’s) Warfighting Capstone Concept (NWCC), the alliance should utilize more outside “mavericks” to add the dynamic and unpredictable elements that make exercise scenarios truly testing. This also means regularly testing reinforcement to the Baltic Sea region from across the Supreme Allied Commander Europe’s (SACEUR) Area of Responsibility (AOR) and not limiting exercises to the region only.
* Scope: War does not take place in one domain only. Air and Missile Defense (AMD) and intelligence, surveillance, and reconnaissance (**ISR**) capabilities, including their **interoperability**, should be routinely and aggressively exercised — to the “**point of failure**” in realistic simulated combat scenarios. Russian non-kinetic tactics, such as information operations, economic pressure, and cyberattacks, will feature in **any real-world** conflict. Allied leaders’ decision-making and the psychological resilience of societies (or lack of it) around these subthreshold threats **significantly impact** defense and deterrence. Exercises will test, socialize, and normalize the assumptions and thresholds involved.
* Duration: Russia’s geographic location and stocks in the region give it a potential short-term local advantage in the early phase of an armed conflict. Western countries’ greater size and technological edge give them a longer-term advantage, though this depends on adequate stocks of smart munitions and effective reinforcement capabilities. Exercises need to test these parameters.
* Escalation: The military response to Russian aggression is only part of the picture. National decision-makers must also rehearse their individual and collective approach to the escalation ladder: for example, the (threatened or actual) test detonation of a small nuclear warhead by the Kremlin, particularly in a contest over the Baltic states.7 This is particularly important given Russia’s aggressive nuclear posture, renewed speculation about US nuclear policy, and the change of government in Berlin to include parties opposed to nuclear weapons on German soil. Exercising escalation should also account for the spectrum of the Kremlin’s so-called **hybrid tactics**, which include **influence operations**, **cyberattacks**, and enabling **new tech**nologies which could undermine or delay the West’s crisis response. The migrant crisis prompted by Belarus, for example, was a real-world test of Western decision-makers’ ability to handle gray-zone escalation. Lessons can be learned from it.
* Flexibility: Russia can choose how it attacks, but it cannot determine how the West will respond. Dynamic and unpredictable ways of countering aggression highlight the breadth and depth of alliance capabilities. The acquisition of F-35s and new naval capabilities (such as Danish frigates) extend the range of responses.
* Technology: Artificial intelligence (**AI**)-enabled decision support tools and synthetic environments may be more **cost-effective** and **faster**. They allow decision-makers and planners to test more **radical courses** of action, to train to failure out of the public gaze, and to pursue different iterations. They also allow national leaders to explore the context and outcomes of strategic dilemmas.
* After action reviews (AARs) should be **shared widely** among allies, and with the public in unclassified formats.

Variations in national capabilities, readiness, budgets, doctrines, and risk appetites present difficulties for multinational exercises in the region. Willingness and ability to participate will vary. But even small steps are better than none, particularly when combined with a **coordinated approach** to messaging. Some aspects of exercises must remain in the classified realm, but more openness would be helpful. The demonstrated willingness to accept costs and make hard choices is an important element in national and regional defense.

Ultimately, exercises are a guide to **better decision-making**. They guide the deployment of financial and other resources. They also focus decision-makers’ minds on necessary political sacrifices. Before embarking on these hard choices, we need to know what they are. Subject to the lessons learned from exercises, we also recommend the following steps to enhance capabilities in the Baltic Sea region.

Boost Capabilities and Security Assistance

Increase contributions to AMD in the Baltic states, particularly from alliance countries with a stake in regional security such as the UK, France, Germany, and the Netherlands. Lack of AMD is the region’s single biggest military weakness. In the event of a crisis, the only US Patriot battalion deployed in Europe will be needed to defend Ramstein (the main US air base in Germany). Polish and Swedish Patriot missiles will be needed in those countries. The Baltic states are the most militarily exposed countries in Europe and also lack the defense budgets to buy these capabilities themselves on a sufficient scale. By enhancing regional AMD, and building on **US** security assistance efforts so far, all of Europe will be **safer** as a result.

Transform Baltic Air Policing (essentially a peacetime deployment) to Baltic Air Defense. This will signal to Russian decision-makers that their anti-access/area denial (A2/AD) capabilities do not automatically give them dominance over the Baltic states in the event of a crisis. This will not happen overnight and serious questions about command and control (C2) will need to be resolved. The balance between the onshore and naval capabilities required and their permanent or persistent presence in the Baltic states can be graduated according to the threat environment. So too is the role of potential deep strikes on the territory of Russia’s Kaliningrad exclave. But the pretense that air policing alone is adequate is outdated and harmful.

Improve **ISR** capabilities in the region. The aim should be an “**unblinking eye**” that can identify what Kremlin forces are doing, long before a crisis actually develops. This contributes to the speed of recognition that is vital in gray-zone or **hybrid war** situations. To help achieve this, regional countries should leverage more unmanned and **autonomous** surveillance capabilities in the air and maritime domains. As part of regional burden sharing, richer countries (such as Sweden) should pay for new intelligence-gathering capabilities that may be deployed, as required, in the airspace, waters, and territory of the Baltic states.

Overhaul the rules, classifications, clearances, and procedures around **data transfer** and processing to ensure **seamless** information sharing required to better enable ISR capabilities. The region is not necessarily short of ISR assets. The **bigger problem**, which has both political and technical underpinnings, is interpreting and sharing the inputs they collect. Within the alliance, procedures and rules are **complicated** and **conservative** enough to make intelligence sharing difficult. Moreover, NATO intelligence-sharing rules do not fit the **specifics** of the Baltic Sea region, where non-NATO Finland and Sweden are in practice more trusted than some countries that are formally members of NATO. Short of NATO accession for Sweden and Finland, the goal should be maximizing information flows with these countries. Regional nations should begin improving these processes within the highly trusted framework of Nordic cooperation before extending further and should ultimately aim to increase information-sharing between the Nordic and Baltic states, particularly for the region’s maritime and air domains. Relatedly, national-level intelligence services should maintain their vital ability to speak truth to power. These agencies should not be in the business of courting public popularity or pleasing their political masters. They must be empowered to share more information with allies and partners in the region.

Maintain and provide more **predictable**, **sustainable**, and **durable long-term** US **security assistance** to the Baltic states and surrounding countries to help realize the abovementioned capabilities. The Baltic Security Initiative (**BSI**) is an important mechanism for enhancing regional defense and **deterrence** and demonstrating **unwavering US commitment** to Baltic Sea regional security. It should be expanded, not reduced, wherever possible. Politically, BSI funding, which is approved by Congress, sends a **strong signal** that the United States and the American people support the region and furthers US strategic interests, including **NATO’s integrity**, the defense of democratic values, and the US economy. Militarily, it also provides a **powerful top-down deterrent** to Russia in one of the alliance’s **most vulnerable** regions.8 BSI offers US security assistance funding to Lithuania, Latvia, and Estonia that is **multiplied** by national contributions to create **critically needed**, **interoperable** capabilities, which are essential to the Baltic states because, despite spending more than 2% of GDP on defense, they still **depend on allies’** support to close capability gaps. However, because the resources for security assistance are assessed and adjusted on an **annual basis** as part of the National Defense Authorization Act (NDAA), by the time money is appropriated, the timeline to utilize BSI funding each year shrinks to around nine months. This makes it **difficult** for recipient countries to deliver **meaningful projects** and impedes **longer-term planning**. The United States should consider adapting such assistance programs to contain more **predictable** and **consistent multiyear funding**, which would create **sustained impact** in the region.9 It should also consider security assistance as a means to support specific force-multiplying capabilities, including recent joint efforts to develop indirect fires, air defenses, situation awareness, ammunition stockpiles, and special forces.

**Solvency---Baltic Cohesion**

**Baltic cohesion is necessary**, though insufficient**.**

**Veebel** and Ploom **18** [Dr. Viljar Veebel, Fellow on Russian Strategic and Military Studies at the Baltic Defence College; Dr. Illimar Ploom, Associate Professor of Strategic Studies at the Estonian National Defence College; 2018; "The Deterrence Credibility of NATO and the Readiness of the Baltic States to Employ the Deterrence Instruments"; *Lithuanian Annual Strategic Review* Volume 16; https://journals.lka.lt/journal/lasr/article/153/file/pdf; KL]

It must be admitted that, from a **substantive** point of view, the potential for regional cooperation is **not too large**. All three Baltic countries **remain tiny** in the international arena, even when combining their resources, which also means that joint procurements may not lead to remarkable material gains for them. However, this does not mean that **immaterial** aspects might not come into play. More precisely, Russia would **definitely benefit** from a situation where even the three small Baltic countries would be **unable** or **unwilling** to cooperate, which would refer to **low coherence** within the Alliance. Altogether, having in mind different priorities of the national defence systems, e.g. in Latvia and Estonia, the potential of **joint military procurements** in both countries seem to remain **largely untapped**, decreasing also the potential of a **common deterrence** strategy.

**Solvency---Cohesion**

**Cohesive security cooperation solves Baltic war.**

**Kundla 22** [LTC Tarmo Kundla; Lieutenant Colonel, Commander of the Chair of Tactics. Lecturer, The Estonian Military Academy; 2022; "Strategic leadership requirements for a Baltic unified military effort"; *Ad Securitatem*, Baltic Defence College; https://www.baltdefcol.org/files/files/publications/AdSecuritatem2022.pdf#page=95; KL]

Introduction

The Baltic states were accepted into NATO in April 2004 after fulfilling all the general requirements stated in NATO Membership Action Plan (NATO, 1999) first issued in 1999. It was a significant effort from the countries as they started to develop their states and armed forces almost from nothing in 1991. To reach the full membership, the Baltic states worked separately and together, being heavily supported by western countries, especially the Nordic states. Historic roots of cooperation among independent Baltic states lay in the interwar period. There were several attempts to form an alliance between the Baltic states, Poland, and Finland in the 1920s, but for different reasons those failed (Männik, 2013 p. 17). Finally, the Baltic Entente was created in 1934, but ‘this format was not utilized as a security and defense policy tool because of increasing tensions in Europe and weak trilateral cooperation’ (Ozoliņa, 2019 p. ix). In the end, all the Baltic states chose to remain neutral and were occupied by the USSR one by one. Learning from history, it was decided in mid-90s that neutrality would not be the policy to follow, and cooperation is the only way how not to remain alone again. However, like in history, the cooperation between the Baltic states today has not been so self-evident. Being competitors for western resources at the same time have made the cooperation relatively hard to achieve. One thing is sure: it needs strategic leadership. ‘Strategic leadership is about developing and maintaining the capabilities that will enable success at the operational and tactical levels of command both today and tomorrow. The objective of strategic leadership is to ensure the long-term effectiveness’ (Institute, 2005 p. 98). Strategic leadership is about leading the institution rather than leading at the strategic level of war (McKay, 2008 p. 106). Regardless of the definition, it is based on human relationships (McKay, 2008 p. 18) and includes also shaping the external and improving the internal environment of the institution (Institute, 2007 p. 48). In the current paper, the author will not differentiate between state (policy) and military strategy. The reason lays in the understanding that strategic leadership is considered more teamwork than individual endeavour. It does not matter whether you are civilian or military, a decision maker, recommender of policy or adviser in military matters.

The **main thesis** of the research paper is that the **security** and defence **cooperation** between the **Baltic states** to **deter Russia** is still **more declarative** than actual, and it is, at least partly, caused by lack of **strategic leadership**. The aim of the paper is to find those strategic leadership requirements which should be followed to enhance the Baltic cooperation and therefore strengthen NATO’s eastern boundary. It is a qualitative analysis with case study elements. At first the author describes the context of the subject – how the cooperation has evolved since 1991, what has driven it and how important it is in today’s security situation. Thereafter the author analyses three different cooperation fields in more detail, namely joint procurements, possible integration of land forces, and the Baltic Defence College (BALTDEFCOL). Based on the comparison of the findings, the author presents recommendations for strategic leadership on how to enhance the Baltic unified military effort to deter and, if needed, to defend the countries.

Baltic cooperation since 1991 – need for strategic leadership There are four main joint projects which illustrate the Baltic states’ cooperation since the restoration of their independence. According to Jermalavičius (2009) and Molis (2009 pp. 32-33) the Baltic Battalion (BALTBAT) was formed in 1994, followed by a trilateral naval squadron (BALTRON) in 1997, a common air surveillance network (BALTNET) in 1998, and the establishment of joint staff college (BALTDEFCOL) in 1999. The most visible and influential projects were BALTBAT and BALTDEFCOL (Vaidotas, 2003 pp. 11-12), especially BALTDEFCOL (Romanovs, 2014). They all are considered successful and sometimes brought up as examples of how a regional cooperation should be organized. Of course, there have been smaller initiatives: cooperation in operations, some joint procurements, and contribution to NATO Response Force (NRF) (Molis, 2009 p. 33). All those joint initiatives helped to develop the Baltic states’ defence forces, enhanced foreign assistance and support, and in the end, were important for the states to become NATO members. However, already ‘five years after accession to NATO, Baltic military cooperation became stagnating’ (Jermalavičius, 2009). The regional cooperation did not disappear, but ‘massive new projects of regional cooperation among the Baltic States have not been initiated’ (Molis, 2009 p. 46). ‘Intra-regional cooperation lost its unique relevance and became part of the wider Alliance’s landscape’ (Ozoliņa, 2019 pp. ix-x). In fact, the problems were there already from the beginning. In his BALTBAT case study, Pete Ilo describes the lack of trust between the Baltic states and how western countries sometimes had to force the Balts to cooperate (2013 pp. 258-260). The main reasons of low cooperation can be described as ‘critical combination of three factors: foreign disengagement, divergent national responses to NATO’s global strategy and the competitive instincts of the three defence organizations’ (Jermalavičius, 2009). The common goal after the restoration of independence which forced the Baltic states to cooperate was the ambition to join NATO. After being accepted 2004, the Baltic states came to the conclusion that their security was guaranteed, and Russia was not seen as the main threat anymore (Männik, 2013 p. 13). Therefore, the cooperation started to erode, and each country followed their own agendas. From the abovementioned initiatives only BALTDEFCOL and BALTNET have survived till today. The former has become a respected professional military education institution (Dilans, 2019 p. 22) and the latter one can be considered as the backbone of all the Baltic Air Forces and is fully integrated into NATO. BALTBAT was deactivated already in 2003 (Ito, 2013 p. 245) and in 2016, Estonia stepped out from BALTRON to turn its focus on the standing NATO mine-countermeasure squadron (Grant, et al., 2019 p. 20). Today’s security situation is completely different compared to the time the Baltic states joined NATO. Attacks against Georgia in 2008 and Ukraine since 2014, as well as constant hybrid actions against the Baltic states and others have forced western world and NATO to reassess the situation and come up with new NATO 2022 Strategic Concept (NATO, 2021). The new NATO military strategy named as Defence and Deterrence Concept, is ‘built on a concept of direct defence designed to defeat an aggressor and such a direct defence capability is a deterrent because it can either defeat an aggressor or impose intolerable costs’ (Group, 2022 p. 17). The two most significant deterrence strategies are: deterrence by denial and by punishment (Rostocks, 2020 p. 23). Knowing that conventional balance in the region is not achievable by the Baltic countries alone, even with the pre-positioned NATO battalions (Veebel, 2018 p. 237), and looking at the geography of the Baltic region, the main conclusion to be drawn is as follows: deterrence by denial will be the Baltic states’ duty and deterrence by punishment will remain for the rest of NATO. The purpose of that magnitude is not achievable if the Baltic countries continue to act separately following their own agendas.

Therefore, the **purpose** of Baltic cooperation today should be to deter Russia by **denial** and, if deterrence fails, to defend until the other NATO countries will join the fight. In the other words, in case of an attack it will be NATO’s fight from the first moment and the Baltic states will be just the first ones to react on the ground. There are three possible scenarios for Russia to act against the Baltics to undermine **NATO cohesion** and **credibility**: a hybrid attack, a large-scale **conventional** attack or a surprise attack. When launched, it will, of course, be a **combination** with some additions like destroying **critical targets** and **infrastructure**, **cyber-attacks**, etc. At least initially, all the Baltic states will be **cut off** from the rest of the allies and must manage with what they have at their disposal. It can be currently estimated that a **hybrid scenario** will be the **most likely** and a surprise attack most dangerous one; however, a **large-scale** attack **cannot be ruled out** (Kundla, 2022). Neither deterrence nor defence is just military business. Effective deterrence involves activities in all DIME domains and the Baltic states’ joint effort supported by other NATO countries. Using NATO terms, comprehensive approach is the basis to approach all the security matters.

To sum up, regarding the security situation, the need for the Baltic states’ strategic level cooperation is **inevitable**, but there are currently no **large-scale** projects ongoing, except the old ones. Most of the cooperation continues to take place proceeded by NATO. The lack of the Baltic states’ ability to deter Russia by denial indicates the absence of strategic leadership. At the same time, there are **lot of areas** where Baltic militaries and MoD-s can cooperate and work jointly. According to Jermalavičius (2009), ‘from sub-regional **contingency planning** to the **integration** of **command**, **control**, **communication** and **information** systems; from **joint procurements** to the organization of common defence **R&D** activities – the Baltics can do a lot together to increase the **credibility** of NATO’s collective defence system in the Baltic region, while saving resources and remaining at the forefront of progressive defence thinking within the Alliance’. Enhanced cooperation between the Baltic states will probably be **not enough** to deter Russia. Therefore, besides the need to rethink the operational strategy and concepts of the Baltic states, it is also **critical** to cooperate with **Finland** and **Sweden** (Grant, et al., 2019 p. 46). It can be stated that there is an urgent requirement for strategic thinking and leadership if the Baltic states really want to successfully deter Russia.

Joint procurements – a field to improve

Many authors, for instance Jermalavičius (2009), Romanovs (2014), Veebel, (2018), Mehta (2019), Grant et al (2019), have studied the Baltic states’ cooperation and pointed out the absence of joint procurements. It is hard to understand why small states with common enemy and limited resources buy and maintain different equipment. The most popular argument for acting jointly is the cost-effectiveness. ‘Joint procurement would **drive down** costs for large defence articles by allowing the smaller Baltic nations to buy in **greater numbers** and allow the countries to share **maintenance responsibilities**, which would **save money’** (Mehta, 2019). Joint procurements are often **cost-efficient** (Veebel, 2018 p. 239). There are also some different opinions, arguing that sometimes it is possible to get a better deal by acting bi-laterally. ‘It could be assumed that the Baltic states main consideration for procuring different equipment of the same type is driven by trying to find the best deal with the money available’ (Romanovs, 2014).

Theoretically, joint procurements are beneficial, but in practice, there are several problems. Mehta (2019) interviewed the Baltic officials and concluded that small-scale procurements are doable and practiced, but there are severe problems with big ones resulting from different budget cycles of the states, different threat assessments, the bureaucracy of the seller country to handle different buyers, and organization of maintenance. There have been some smaller-scale joint procurements but none regarding the main equipment. For example, Estonian and Latvian procured jointly Lockheed Martin long-range radars (Jermalavičius, 2009) and the Baltics states together acquired Carl Gustav ammunition (Romanovs, 2014). In 2020, Estonia and Latvia procured Carl-Gustav M4 grenade launchers and are planning to buy practice hand grenades (BC, 2020). In contrast, between 2016 and 2021, all the three Baltic states have acquired different types of main weapon systems, for example, infantry fighting vehicles: Estonia bought 44 CV-90’s, Latvia 123 CVR(T)’s and Lithuania 88 Boxer’s Combat vehicles. The same goes for artillery, 12 K9 Thunder’s, 47 M109’s and 21 Pz2000’s, respectively, and air defence systems, namely Mistral 3, RBS70 Mk2 and NASAMS, respectively (Finabel, 2019 pp. 17-19). Based on the procurement programs, it can be concluded that the Baltic states are developing different land forces and there is practically no cooperation concerning joint procurements. However, in the light of the Russia-Ukraine War, there can be seen some positive changes in joint procurements. Now also big projects are agreed and in process. The Estonian Centre for Defence Investment (RKIK) and the Latvian Ministry of Defence announced ‘the largest procurement in the military field so far’ by planning to buy different types of vehicles together (LETA/BNS/TBT, 2022). Unfortunately, Lithuania is not taking part in this project. At the end of 2021, all the Baltic defence ministers revealed plans to procure M270 Multiple Launch Rocket Systems (MLRS) (ERR, 2021). The last is not just joint procurement; it can be illustrated as joint capability development.

The issue is not so much about cost-effectiveness but **interop**erability and military necessity when preparing to fight against Russia. Interoperability means ‘the ability to **act together coherently**, **effectively**, and **efficiently** to achieve Allied tactical, operational and strategic objectives’ (OFFICE, 2021). Different main weapon systems bring about **different organization**, **procedures**, **tactics**, and demand **different logistical** and **command solutions**. On the one hand, diversity is good, but on the other hand, it works against you when there is a need for **joint collective effort** to win the war. The side effects on tactical level can be and have been mitigated by extensive joint training. But on the operational level and considering the sustainability of force, training doesn’t help. Again, in the first days of a potential war, there will be no issues, but after that, all the Baltic states will be dependent on **outside support** regarding supplies, spear parts, ammunition etc. It is **much easier** for NATO and Allies to help the Baltic states as **one entity** with similar goods than three different countries with very different ones.

It can be said that there is no need for joint procurements just to buy stuff together, especially in circumstances where every state has developed their land forces according to their own threat assessment, geographical conditions, resources available, and following **NATO standards**. However, as concluded previously, to deter and defend, there is no other options than to fight together. In other terms, the real need for **joint procurements** arises from **military necessity** – to create conditions to win the war. It will not be so much about cost-effectiveness, but building, developing, and maintaining capabilities in a **coordinated manner**. In other words, it is a question of strategy, how to create conditions for future success on tactical and operational level. This joint strategy and future perspectives seem to be missing currently.

**A common Baltic threat assessment solves cohesion.**

**Klein** et al. **19** [Colonel Robert M. Klein, Senior Military Fellow in the Center for Strategic Research (CSR), Institute for National Strategic Studies, at the National Defense University; Lieutenant Commander Stefan Lundqvist, Ph.D., Researcher and Faculty Board Member at the Swedish Defence University (SEDU); Colonel Ed Sumangil, USAF, Senior Military Fellow in CSR; Ulrica Pettersson, Ph.D., assigned to SEDU, Adjunct Faculty Member at Joint Special Operations University; 11-2019; "Baltics Left of Bang: The Role of NATO with Partners in Denial-Based Deterrence"; *Strategic Forum* 301, Institute for National Strategic Studies, National Defense University; https://inss.ndu.edu/Portals/68/Documents/stratforum/SF-301.pdf; KL]

Strengthen Political Cohesion and Resilience

Enhance political cohesion by developing a common threat assessment for the Baltic Sea region. The first step to greater **political cohesion** and **resilience** is to work toward a deeper **common threat assessment**. This is an important means to **building trust** across the region, which is strong between some countries (notably Sweden and Finland, and Poland and Lithuania) but much weaker among others. Building trust should be an explicit goal of national decision-makers with an **extensive program** of **exchanges**, **joint training**, and **information sharing** to create the personal and institutional ties that underpin a common strategic culture. A common threat assessment should involve **pooled bottom-up analyses** of Russia’s intentions and capabilities, coupled with **high-level intelligence** inputs from countries outside the region. An unclassified version should be published on an annual basis, endorsed by at a minimum the four Nordic and three Baltic countries and Poland. It would be helpful if other countries, notably Germany but also the Netherlands, France, the UK, and the United States, would endorse the assessment too. Undoubtedly, national threat assessments vary because of geography and history. Political considerations play a role too: Poland and the Baltic states’ national interest is to maximize the foreign military presence on their territories. Other countries cherish their flexibility. Nonetheless, the **search** for common ground will **in itself** be useful.

The classified version of such an assessment would form a **useful basis** for military planning, exercises, and budgeting. This would not be a substitute for NATO and other allied efforts in this respect. But it would have a **quality of focus** and **authority** by virtue of the **expertise** and proximity of the countries endorsing it. It would also be free to state blunt truths that are often lost in the thickets of Brussels politicking.

**Cohesion solves Baltics escalation.**

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Russia’s annexation of Crimea in 2014 and its subsequent involvement in the war in eastern Ukraine have caused deep concern in the capitals of North Atlantic Treaty Organization (NATO) members. In the 2016 Warsaw Summit Communiqué, NATO labeled Russia a “challenge [to] the Alliance” and “a source of regional instability.”1 These concerns reflect the reality that a war between Russia and NATO, although unlikely, is not unthinkable anymore. The risks of tensions escalating in general or in a crisis are **particularly high** in the wider Baltic region, which includes the three Baltic states (Estonia, Latvia, and Lithuania), Poland, parts of western Russia, and the adjacent waters of the Baltic Sea.2

An underlying challenge is that Russian interests and strategy toward the region are **ambiguous** and leave much room for **speculation** and **misinterpretation**. Specifically, NATO allies **cannot be sure** what Moscow’s intentions toward the Baltics and the alliance are. Does it aim to merely intimidate these countries by various threats? Or does Russia plan to invade? Particularly prevalent in the Baltic states and Poland—all of which have borders with Russia—these concerns have prompted NATO to reassure its easternmost members with a number of limited defensive measures, most prominently by agreeing to deploy four multinational battalions to the three Baltic states and Poland to deter eventual Russian aggression.3 Meanwhile, Moscow strongly denies any malign intentions toward NATO, and instead points to the alliance as a threat to its own national security.4

As a consequence of these ambiguities, it is possible that NATO may be overestimating the threat emanating from Russia, and the alliance could end up precipitating exactly the kind of security threat that it seeks to avoid. For example, the well-intentioned defensive measures for the Baltic states and Poland that allies agreed to implement at the Warsaw Summit could reinforce legitimate as well as imagined Russian security concerns. Moscow has already denounced NATO’s actions as aggressive and announced retaliatory steps.5 Some NATO members have warned the alliance of doing too much and assert that enhanced defensive measures might only further deteriorate the security situation in the region by raising tensions with Russia.6 As a consequence, both sides may enter a security dilemma that could raise tensions and make conflict more likely, if this is not already happening.

Conversely, it is also possible that NATO may be underestimating the Russian military threat. Russia’s strategy of conflict, as stipulated in its doctrine of new-generation warfare,7 appears to be comprehensive, involving everything from propaganda to potential nuclear use. Failing to identify a sound response that addresses the threat in its totality could be dangerous. For example, NATO’s defensive measures, by being too limited, could lead Moscow to deliberately test allies’ resolve, perhaps even by military means.

Some NATO members argue that the alliance is still not doing enough to credibly deter Russia.8 The geography and the military balance in the region present real challenges to NATO in defending Baltic allies. Russia has a much larger force presence than NATO in the region and, by using land routes, can quickly reinforce equipment and personnel. NATO, by contrast, would have to fly or ship in reinforcements—a much slower process. Additionally, Moscow continues to hold large-scale military exercises based on aggressive scenarios against neighboring states such as Poland, close to NATO’s borders. The latest one—Zapad 2017—peaked in September 2017. Such exercises, some of Russia’s neighbors fear, could be used as a cover for a limited military attack against them.9

The conventional challenge in Europe is compounded by Russia’s increasingly aggressive behavior in the nuclear realm. On various occasions since 2014, the United States has publicly accused Russia of violating the Intermediate-Range Nuclear Forces (INF) Treaty by developing and, more recently, deploying a ground-launched cruise missile (although Washington has not indicated whether it believes these missiles are designed to accommodate nuclear or nonnuclear warheads or both).10 Furthermore, Russia frequently issues blunt nuclear threats toward NATO allies. For example, in March 2015, the Russian ambassador to Denmark said that if Danish warships contributed radar capacity to NATO’s missile defense system, “Danish warships will be targets for Russian nuclear missiles.”11

All these developments create **political** (as well as military) problems for NATO. They lead to **pressure** on NATO to review its own deterrence and defense posture, including its nuclear component, and, perhaps, to formulate more muscular responses. But such a debate—already tentatively taking place at NATO Headquarters—risks **eroding unity** among NATO allies, which have a wide range of different preferences in the nuclear realm. This erosion of unity could **undermine deterrence**. A military alliance at odds over its **own deterrence** and **defense posture** could be perceived as **weak** by Russia, making it a potential target for **military blackmail** and **coercion**.

Preserving **NATO’s unity** is, therefore, a **key task** for the alliance, even more so since Russia’s doctrine of **new-generation warfare** is challenging NATO militarily and politically in many other respects. All three Baltic states, for instance, are subject to **relentless** Russian attacks through **propaganda**, **disinfo**rmation, and **outright hate speech** that have become more virulent since 2014.12 These states are home to **significant** ethnic Russian minorities that receive Russian state-sponsored media almost exclusively. This **propaganda** deepens existing divides, which date back to the Soviet occupation, between the different populations groups in the Baltics.13 Perhaps Russia does not seek to stoke protests or outright unrest among minority groups. But even if it does not, Moscow’s negative influence nonetheless increases the risk of a **domestic crisis** in one of the three states, in the wake of which there could be **growing domestic pressure** on the Kremlin for Russia to come to the aid of Russians living abroad.

Even if Moscow is not planning for deliberate aggression against NATO, **accidental escalation** is another potential risk. Russia has stepped up **military brinkmanship** vis-à-vis NATO member states since the outbreak of the war in Ukraine.14 In 2016 alone, Russian military aircraft violated Estonian airspace five times and often came **extremely close** to allied aircraft.15 These actions could result in an accident, potentially killing NATO and Russian service personnel. In the wake of such an accident, tensions could rapidly mount, especially given **domestic pressure** to retaliate. NATO and Russia might find themselves unable to control the subsequent escalation.

So far, NATO has responded with an incremental approach, focused on collective defense, crisis management, and cooperative security. At its 2014 summit in Wales, NATO emphasized the assurance of allies, particularly those in the Baltic region, who felt most vulnerable.16 By the 2016 Warsaw Summit, the emphasis had shifted to deterrence and defense, as allies set out NATO’s primary responsibility as being “to protect and defend our territory and our populations against attack.”17 By agreeing to deploy multinational forces from sixteen member states to the region, allies aimed to increase the credibility of NATO’s deterrence and defense posture against Russia by trying to convince Moscow that an attack on one would be an attack on all. The Warsaw Summit Communiqué also highlighted a possible cooperative way forward by underscoring political dialogue with Moscow aimed at avoiding misunderstanding, miscalculation, and unintended escalation by means of transparency and predictability.

Indeed, NATO’s deterrence and defense approach still contains **loopholes** that must be closed. But **deterrence alone** is ill-equipped to manage the **nonkinetic** or **accidental** escalation risks that Russia’s doctrine of **new-gen**eration warfare pose. NATO needs a **comprehensive**, threefold strategy that addresses these risks and takes into account the views of allies in the **wider Baltic region**.18 As NATO seeks to formulate an effective response to Russia’s policies and actions, the alliance is facing three major tasks: (1) how to calibrate its deterrence measures to prevent deliberate Russian escalation and to assure its easternmost members; (2) how to maintain alliance unity in light of the differing threat perceptions—particularly toward Russia—and defense priorities of the members states; and (3) how to prevent possible inadvertent or accidental escalation with Russia. If left unattended, these challenges will further increase the already high risk of escalation in the Baltic region. The focus should be on what NATO can do now to reduce the risk of escalation in the future, rather than on the separate (albeit important) question of how NATO should try to manage escalation should a crisis occur.

To this end, NATO should close **dangerous loopholes** in its current deterrence and assurance approach, so as to deter Russian aggression against NATO and prevent Moscow from using deliberate escalation to coerce the alliance. The alliance should also double down on efforts to **enhance resilience**—that is, increasing the ability of member states to **absorb shocks**, such as sudden **electricity outages** or **large-scale cyberattacks** on corporate networks. NATO must make its societies—in particular its easternmost allies and Russian minorities living there—more immune to Russian **destabilization efforts**. Finally, by engaging Moscow in talks on risk-reduction measures, NATO should seek to diminish the potential for accidental escalation, especially given the spike in dangerous military encounters. Over the longer term, it is also possible that consultations with Russia could lead to more far-reaching arms control talks about conventional forces in the region.19

**Solvency---Say Yes**

**Defensive approaches are palatable.**

**Klein** et al. **19** [Colonel Robert M. Klein, Senior Military Fellow in the Center for Strategic Research (CSR), Institute for National Strategic Studies, at the National Defense University; Lieutenant Commander Stefan Lundqvist, Ph.D., Researcher and Faculty Board Member at the Swedish Defence University (SEDU); Colonel Ed Sumangil, USAF, Senior Military Fellow in CSR; Ulrica Pettersson, Ph.D., assigned to SEDU, Adjunct Faculty Member at Joint Special Operations University; 11-2019; "Baltics Left of Bang: The Role of NATO with Partners in Denial-Based Deterrence"; *Strategic Forum* 301, Institute for National Strategic Studies, National Defense University; https://inss.ndu.edu/Portals/68/Documents/stratforum/SF-301.pdf; KL]

Despite some positive signs such as rotational deployments and exercises to the BSR, it remains to be seen whether NATO and partner nations have the political will to implement the measures necessary for an effective denial-based deterrent strategy. Arguably, A2/AD capabilities and hedgehog defenses would be costly to build and maintain, and there is little appetite outside the Baltics themselves to pay the bill. These criticisms are valid. Nevertheless, the necessary political will to defend the Baltic states is suspect no matter what deterrence strategy NATO decides to pursue. As a recent paper concluded, “protecting **political will** and **strengthening** it for the future foundation of NATO should become a **critical** alliance function.”48 However, **denial-based** deterrence can provide a **common vision** of a potentially available solution, one that is **defensive** and therefore **more palatable** for NATO and partner states to accept. Already, the Baltic states, along with Sweden and Finland, have articulated **Total Defense** as their primary means to counter or repel attacks. The Alliance needs to build on this **trend**.

**Solvency---A2/AD**

**Air-based ISR is key.**

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To remedy these shortfalls, NATO should deploy a **robust** ISR network that **integrates** NATO and non-NATO assets to provide early indications and warning of impending Russian attacks and the critical component to an effective air defense system. Additionally, NATO and its partners should supplement air presence with a robust integrated air defense network to ward off Russian attacks. By focusing foremost on air defense, NATO can raise the cost of potential Russian attacks, preserving NATO forces, while providing time to transition from a defensive to an offensive air campaign.

The Alliance must first improve the technical capabilities of the Baltic states and those of the surrounding non-NATO countries if it is to deploy a robust integrated ISR network. To that end, the United States could deploy its unmanned aerial systems (UAS) or ground-based radars to the region. Utilizing UAS, however, will come at the expense of other U.S. operations around the globe.54 Rather than relying on the U.S. military to provide both manpower and assets, the Baltic states could lease UAS or other intelligence capabilities from U.S. or European commercial entities.55 NATO and its regional partners should also invest in low-cost and commercially available micro and cube satellites to create a resilient space-based ISR capability.56 Furthermore, the Alliance and partner nations must ensure **system compatibility** and **interoperability** to create a **viable network** capable of providing **early indications** of an impending Russian attack.57

An **even greater** challenge is creating the structures and processes for **intelligence-sharing**, an undertaking complicated by nations reluctant to participate or share data with their neighbors. RAND analyst Andrew Radin suggests bilateral intelligence-sharing agreements among the **U**nited **S**tates, **Baltic states**, and **NATO countries** to **overcome** the Alliance’s **limited progress** in this arena.58 However, sharing and cooperating needs to extend **beyond** the intelligence realm and must include the integration of regional air defense assets such as radars and missile systems and incorporate both ground- and air-based systems. The five-member Nordic Defense Cooperation provides a forum outside of NATO for such cooperation.59

General Breedlove further advocates for a layered regional air defense construct that links the national capabilities of both NATO and non-NATO allies. Specifically, Breedlove recommends including the Baltic maritime domain for air defense to “[deepen] the air defense network in the region during a crisis.”60 Leased capabilities such as air defense radars in Estonia, Latvia, and Lithuania can further refine the regional air picture when **shared with NATO** and other surrounding countries.61 Such initiatives must overcome the same challenges that NATO encountered with intelligence-sharing.62 They will also require a concerted diplomatic and political effort from NATO to ensure participation by regional countries affected by the Russian threat. The initiative to integrate all of these capabilities should fall under a new and broader Baltic Air Defense mission, which would replace the current Baltic Air Policing mission.

NATO established the Baltic Air Policing mission in 2004 to “enforce the sovereign airspace of the three Baltic countries.”63 The mission has served as an important check on Russian aggression and recklessness in the air against both NATO and non-NATO members. Since the 2014 Russian incursion into the Crimean Peninsula, the mission has gained additional support.64 Although NATO has increased the number of aircraft to respond to increased tensions in the BSR, “existing processes” and the Russian threat prevent the Alliance from rapidly increasing the number of air assets in “the event of a military crisis in the Baltic.”65 The transition from the Baltic Air Policing mission to the Baltic Air Defense mission will enable NATO to defend the “prepositioned equipment, rotational troops, and key infrastructure and transport nodes” as well as improve the Alliance’s ability to respond more rapidly to military crises in the Baltics.66 To enhance operational flexibility, NATO and its partners should also establish easy access agreements to permit the movement of military assets across borders in the event of a crisis without prior diplomatic approval.67

The Russian A2/AD threat in the BSR negates many of airpower’s advantages, and for the first time since the Cold War, NATO and its partners may not be able to achieve air dominance. To offset this new reality, NATO and its partners must develop their **own A2/AD** network in the region starting with a credible air defense network that integrates high-end assets, low-cost systems, and traditional airpower to provide a check on future Russian aggression in the BSR. Protecting vulnerable military bases and assets in the region will allow NATO and its partners to consolidate forces and eventually transition from a defensive to an offensive campaign, one with the potential to escalate using the full range of NATO’s military capabilities, including the potential use of nuclear weapons if needed, against Russian forces.

**A2/AD deters invasion. Success requires AI and cyber integration.**

**Vershinin 20** [Alex Vershinin, Lieutenant Colonel Alex Vershinin, USA, is Director of Technical Integration at the Army Futures Command Studies Group; 3-31-2020; "The Challenge of Dis-Integrating A2/AD Zone: How Emerging Technologies Are Shifting the Balance Back to the Defense"; *Joint Force Quarterly* 97; https://ndupress.ndu.edu/Portals/68/Documents/jfq/jfq-97/jfq-97\_13-19\_Vershinin.pdf?ver=2020-03-31-125227-110; KL]

Today, America’s adversaries are building antiaccess/area-denial (A2/AD) zones to keep the U.S. military out of key strategic regions. A2/AD is a series of sensors; antiship, antiaircraft, and ground defenses; and long-range fires utilized by U.S. competitors and designed to prevent the United States from entering into a close fight.1 We see Chinese A2/AD zones set up to deny U.S. access to Taiwan and the South China Sea. Russia uses A2/AD zones in Kaliningrad, Crimea, the Kola Peninsula, and the Kuril Islands to block key maritime avenues of approach. In the past, the weakness of these zones were the command and control nodes, which formed a single point of failure. Utilizing precision-guided technology, the United States would wage a short, inexpensive decapitation campaign aimed at these nodes. Their destruction would break up integration of enemy defenses, also called dis-integration. For decades, the offense-defense balance was firmly on the offense. **Emerging tech**nologies in the fields of network, **a**rtificial **i**ntelligence, and space are shifting the balance **back to defense**, making these zones more dangerous. At the same time, the United States may have overestimated the effects of long-range strike capabilities after three decades of fighting nonpeer competitors. Unable to fight a short decapitation campaign, the United States may be forced into a prolonged attrition campaign, at unacceptable political costs.

What Is A2/AD?

**A2/AD** zones are composed of intelligence, surveillance, reconnaissance (**ISR**), and defensive and offensive strike systems. ISR systems are utilized to spot **incoming threats** for engagement by **defensive strike** systems. Offensive strike systems attack enemy bases, logistics, and command and control (C2) infrastructure seeking to delay the buildup of U.S. forces. Adding to the effectiveness of the A2/AD zones are the decoy and deception operations that favor ground-based defenders and increase the defender’s survivability. **Combinations** of these techniques with emerging technologies are making **defense** the **stronger form** of warfare for the foreseeable future. The key strategic objective of the defender is not to defeat the United States in battle, but to increase the costs to the United States until the potential political gain is outweighed by the loss.

Current: Advantage Offense (United States)

Traditionally, the defender has relied on combinations of ground-based radars, human intelligence, and ground reconnaissance to gain an operational picture. Wealthier states could afford to augment these sensors with an Airborne Warning and Control System (AWACS), consisting of powerful radars mounted on large passenger planes, unmanned aerial vehicles, and space assets. The augmenting assets are expensive and available only in small numbers. This makes them early high-value targets, unlikely to survive prolonged conflict. Within a month of conflict, the United States would destroy most of them, forcing the defender to rely on his primary systems for early warning and targeting.

For the U.S. military, the main strike capability has always been land- and sea-based airpower. U.S. adversaries’ solutions were ground-based air defense. These air defenses are relying on ground-based search radar to identify incoming strikes and attack radar, which paints the targets for the defending missile. The search radar has numerous weaknesses. It is stationary; thus, its coverage is limited and can be bypassed. Once turned on, electronic warfare (EW) aircraft can identify its location and destroy it with standoff antiradiation missiles that home in on radar emissions. Historically, an attacking air force can suppress air defenses after a month-long air campaign.2 Ground search radars can be augmented with AWACS. These aircraft are more survivable than ground-based radars due to their mobility, but the introduction of long-range and very long-range air-to-air missiles, together with low observable aircraft, are rapidly negating the effects of AWACS, retaining advantage for offense.

Reliance on ground-based search radar forces the defender to centralize the C2 structure. Passing targeting data between batteries requires a single central control node. This weakness is exacerbated by the effectiveness of suppression of enemy air defense missions using antiradiation missiles. Unable to continuously emit, defenders must rely on rolling emissions by several radars to gain a picture of their airspace. It is a process where several radars cover the same area and turn on and off for short durations before moving. Only a centralized headquarters can coordinate that effort and tie it in with defending fighters. This gives the attacker few key nodes for targeting. Destruction of these nodes will rapidly dis-integrate the enemy’s A2/AD defense. The missile launchers will still be there, but they will not be able to engage without warning and targeting data telling them where to shoot. So far, the balance is in favor of the offense.

Next 10 Years: Advantage Defense (Adversary)

Emerging technologies are changing this 10-year prediction. One key technology is the miniaturization of cameras and satellites. New microsatellites are cheap, small, and effective. A single rocket can deliver 80 small photo reconnaissance satellites into orbit.3 This technology has allowed the U.S. firm Planet to photograph any corner of the Earth with one of its 200 satellites, updating images every day with 2-meter resolution.4 The defender does not need to cover all the Earth; he just needs to cover the conflict zone. He can accomplish this by seeding the orbit over the conflict zone with 300 to 500 microsatellites, especially if these satellites are able to generate imagery of 1-meter resolution and transmit data every 5 to 10 minutes. This satellite constellation will have complete photo coverage of the battlespace and be able to spot any aircraft or ship coming into the conflict zone. This system is even more dangerous because antisatellite weaponry is extremely expensive. For example, both antiballistic and antisatellite (Standard Missile 3, or SM-3) missiles cost between $15 and $18 million each. To make matters worse, in 2018 the Department of Defense planned to buy only 40 of them.5 There may simply not be enough antisatellite missiles to destroy an enemy constellation. There are direct energy weapons coming online, and the Russians recently claimed to have operationalized one.6 Yet even those systems are few in number and may not be able to attrit a satellite constellation faster than the enemy can reseed it. In short, this constellation may be extremely survivable to the point where an attacker might not be able to neutralize it due to the large number of targets.

Space-based ISR will be augmented by aerostats. These are high-altitude balloons or blimps. They can maintain a position at 70,000 feet above sea level and have visual coverage of up to 775 miles.7 Aerostats vary in cost but are far cheaper than interceptor missiles and can be easily replaced. Functionally, they are like microsatellites—a cheap and resilient, wide-area ISR system.

More powerful **high-speed computers** allow **algorithms** to **rapidly process** thousands of surveillance images, identifying incoming aircraft or ships based on preprogrammed **image recognition**. It also allows **prediction** of **trajectories** based on several images collected with the ability to pass that data across the battle network. The **U**nited **S**tates has been working on a **similar capability** in Project Maven.8 This data will not be enough for targeting, but it will generate an **early warning** system robust enough to replace ground-based radar systems without any of their weaknesses. As computers get smaller, they can be mounted on the microsatellite. This allows data processing to be done in space and only targeting data to be passed across the network. This reduces the bandwidth requirements and speeds up the time to identify targets. Instead of updating target location every 5 minutes, it can be done every minute, resulting in greatly increased effectiveness of early warning systems.

Where an attacker can gain an advantage is in the defender’s logistics. Once enemy air defense artillery fires, it requires resupply. An attacker can use the same space-based ISR combined with high-speed computing power to develop algorithms to track resupply vehicles traveling to locations from which missile launches have been detected. This method will give the attacker a general idea where the enemy defenses are; unfortunately, the defender must start shooting before it can be utilized.

Another defensive advantage is **electronic warfare**. The increased **bandwidth** and **processing power** of computers allow U.S. adversaries to network their electronic reconnaissance. By networking all his EW reconnaissance assets with analytical systems, the defender can **analyze** the emissions of attackers in real time and determine which targets are real and which are **decoys**. It can rapidly identify incoming threats that generate emissions that may have been missed by other systems. Russia has this capability in its Moskva-1 system.9

Underpinning the enemy system is the network. For any data to be relevant, it must be easily passed from one system to another. The network must be **robust** and **secure**. Quantum computing technology introduces communications that are **long range**, **difficult to locate**, and **nearly impossible** to break into.10 This network allows data to be **rapidly passed** between early warning satellites and ground-based defense systems. In addition, the defender owns terrain and will have time to lay **fiber cable** between his battle positions, reducing emissions and defending its network against **jamming**. It will be difficult to isolate specific portions of the battlefield. We know that our adversaries are looking to develop such networks and technologies, and it is only a matter of time before they succeed.11

How the New ISR Comes Together

The defender will retain ground-based search radars but keep them off and rely on satellites and aerostats to provide early warning and to cue attack radars. Without emissions by the ground-based radars, the attacker will be unable to locate enemy antiaircraft and antiship missile batteries before they fire. The ground search radars will only be activated if the network fails, giving the A2/AD complex redundancy should it be temporarily dis-integrated. Neutralizing them will become far more time-consuming and costly in terms of munitions expended and aircraft lost. The penetration of a robust A2/AD system requires the attacker to converge complementary capabilities from multiple units and services. The challenge is the amount of time needed to plan such a deliberate operation and the availability of key capabilities. If any capability such as EW aircraft is not available, then the entire mission must be canceled.

The digital network that passes data directly from satellite and aerostat early warning systems to the ground-based shooters allows the defender to **decentralize** command and control. Data carried across the network is generated by each reconnaissance node and is seen by all shooting nodes. For example, when a satellite constellation picks up a target, it automatically puts the data out on the network so that every shooting battery sees it without headquarters in the loop. Even fighter aircraft can operate independently based on priorities published prior to conflict. This system removes headquarters as a **single point** of failure in a defender’s A2/AD zone, making the task of dis-integrating more challenging. A recent speech by General Valery Gerasimov, chief of the Russian general staff, indicates that this is the direction Russia is planning to go.12

Survivability

The next key topic is the **survivability** of adversary A2/AD systems. There are two issues. The first is the effects that munitions have on targets and the number of strikes needed to fully neutralize enemy defenses. The second is the increased effectiveness of modern decoys and camouflage.

Decreasing Effects of Long-Range Fires

The most common long-range fire systems employed by U.S. forces are Tomahawks and Joint Air-to-Surface Standoff Missile–Extended Range (JASSM-ER) long-range missiles. Their key advantages are their long range (over 1,000 kilometers), precision, and the absence of danger to human pilots. They can be delivered by aircraft, submarines, and surface ships. In the past, these weapons were fired early in a conflict to destroy search radars, degrade airbases, and neutralize key nodes in an enemy’s A2/AD system. The effectiveness of these weapons may be overestimated because we have fought nonpeer enemies. During the conflict in Syria, the United States employed massive cruise missile strikes on two occasions; in both cases, the damage inflicted was in no way proportional to the amount of munitions used.

During the strike on Shayrat Airbase on April 7, 2017, the United States fired 59 missiles. Satellite imagery shows only 44 targets hit, although some may have been hit twice.13 It is possible that Russian jamming may have diverted some missiles off target, although there is no way to be certain without access to classified information. Russia’s Krasukha, an electronic warfare jamming system, was reported in the area at the time of the strike.14 Regardless, the airbase was launching airstrikes less than 24 hours after the attack.15 While the base was warned an hour ahead of the strike, it was not equipped or postured to endure a conventional precision strike.

The second strike took place on April 14, 2018. A combination of 109 JASSM-ERs, Tomahawks, and SCALPs (a European cruise missile) was fired at six buildings. The second strike was purely political in nature and is harder to assess for weapon effectiveness. There are indications that some of the incoming missiles (Tomahawks and SCALPs) were intercepted. The Russian government has presented missile remnants showing clear damage from air defense artillery (ADA) fragmentation impacts.16 In addition, there is video evidence from Damascus showing incoming missiles intercepted by defensive missiles.17

At sea, the situation has been even more difficult. An attacker’s surface ships entering A2/AD zones are vulnerable to antiship missiles, especially new hypersonic systems such as the Chinese DF-26 and Russian Zircons. Even submarine launches are becoming a challenge as defending diesel submarines are becoming quieter and increasing their submerged time thanks to independent air propulsion. During an April 2018 North Atlantic Treaty Organization (NATO) missile strike, a state-of-the-art British Astute-class nuclear submarine was located and harassed by a pair of Russian Kilo-class diesel submarines. It is suspected that it failed to participate in the attack because of the harassment.18 The combination of antiship missiles and cheap diesel submarines can be used to keep attacker’s ships away from an A2/AD zone. It is possible that in the future, aircraft will be the only means of reliably launching cruise missiles.

The number of missiles required to destroy a target is **another issue**, and there may not be enough missiles in U.S. inventories. Official reports indicate that approximately 100 to 150 missiles are purchased every year.19 Quick math shows that missiles introduced in 1983 would result in 4,500 missiles in stock, at 125 missiles purchased for 36 years. About 2,000 have been expended in combat.20 That leaves an inventory of 2,500. At 100 missiles per major target, the U.S. stockpile is empty after 25 targets. Even then, the damage is rapidly repairable as the Shayrat Airbase strike demonstrated. Once the stockpile is depleted, the United States will be reliant on replacing hundreds of Tomahawks and JASSM-ERs a year. As enemy EW and ADA continue to improve, the required expenditure of missiles per target will only go up. Traditionally, the United States could rely on its industrial base to ramp up prior to conflict. This may not be possible. A recent report by an interagency task force points to a decline in U.S. industrial bases’ potential. A decrease of skilled labor, combined with foreign parts in the supply chains, suggest that the United States may not be able to ramp up production prior to conflict. Instead, America may suffer temporary disruption of production.21

Once standoff weapons are expended, the attacker will be forced to rely on manned aircraft to penetrate the A2/AD zone. This will immediately **drive up** the cost—in **lives**, **aircraft**, **finances**, and **p**olitical **c**apital for the attacker. Manned aircraft can generate far more strikes but are vulnerable to the same ADA as a cruise missile. In addition, there is a human factor. Faced with incoming fire, pilots may choose to drop their munitions and abort. Cruise missiles will press on, no matter the odds.

A2/AD zones are able to soak up **tremendous amounts** of conventional fire power without **long-term** effects, especially those of near-peer competitors whose industrial base will replace losses and restore the effectiveness of A2/AD zones after repeated strikes.

One of the best examples of A2/AD zone resilience is the Siege of Malta, which took place from June 1940 to November 1942. The island, sitting in the middle of the Mediterranean Sea, was able to conduct air and sea denial against Axis shipping for the duration of the North African campaign. Despite committing over 2,000 aircraft during the campaign, German and Italian forces failed to neutralize the island for any length of time. When the battle was over, Malta-based forces had sunk 23 percent of total European Axis shipping. The key to the island’s defenses was heavy ADA, distribution of aircraft across numerous small airfields, and a constant air patrol. Logistics were distributed across numerous small caches rather than one large supply point. The airfields were rapidly repaired and put back into action. The key takeaway from that battle is that most damage inflicted on an A2/AD zone is temporary and will be repaired given even a short respite.22

Defenders can use many of the same techniques today. Dispersing aircraft across multiple airfields, always keeping a combat air patrol airborne, and using highway segments as runways can serve to make fixed-wing aircraft more survivable and allow them to enhance the A2/AD zone. Strikes at airbases work only if aircraft are on the ground. This system’s point of failure is sustainment. Using highway segments increases survivability, but someone must fuel, rearm, and then park the aircraft. Maintenance is a major issue, especially for fifth-generation aircraft. During Operation Desert Storm, U.S. F-15s and F-16s generated one sortie a day. In 2018, F-35s generated only 0.33 sorties per day while flying from USS Essex against the Taliban.23 Providing maintenance assets at dispersed locations requires considerable coordination. Although both sides have to contend with long-range fires, the defender has the advantage because he had years to plan and rehearse dispersed operations on familiar terrain.

It is important to note that munition effects cut both ways. There is an assumption that Russian missiles will destroy NATO infrastructure and prevent use of NATO airbases in range of Russian A2/AD zones. This is highly unlikely. Russian missiles are newer, and the country has not had time to build large stockpiles. As noted above, it takes almost 100 missiles to close an airfield to operations, and the effect is only temporary. The U.S. Air Force adaptive bases concept adds to resilience by further spreading out aviation assets and increasing the Russian target list. The Russians are far more likely to concentrate their limited missile inventory on key targets such as C2 nodes and logistic support areas, including forward fuel storage facilities.

Decoys and Deception

The capacity of the defense is further increased by **decoys** and **deception** countermeasures. These can work both ways but usually favor the defender. Decoys are used to absorb fire power and divert from real targets. Attackers can use decoys to mislead a defender and overwhelm the ADA with targets, but with aircraft being the main striking platform, this becomes more difficult. In theory, airborne decoys are possible, but they must fool radar, EW, and the visible spectrum from space-borne ISR assets, all while maneuvering at Mach 2. The price tag of this decoy will rapidly approach the cost of an actual combat aircraft. Ground systems are much easier to hide using underpasses and vegetation, while ground decoys are cheaper since they can be stationary. The defender has a major advantage when it comes to camouflage and deception operations.

During the 1999 conflict in Kosovo, the Serbian army made extensive use of decoys to absorb NATO airstrikes. According to one report filed by the U.S. Air Force Munitions Effectiveness Assessment Team, 90 percent of reported hits were on decoys. In an extreme case, the Serbs even managed to protect a bridge by constructing a decoy 300 meters downriver. The decoy bridge was designed to be seen from the air and was struck multiple times by NATO aircraft.24 The spoofing did not end in visual range. Serbian air defenses also used extensive radar decoys to divert NATO suppression of enemy air defense missions away from actual radars. Serbian Colonel Zoltán Dani, commander of the 250th Air Defense Missile Brigade, used old radar sets pulled from obsolete fighters to divert NATO strikes away from search and attack radars. During the war, his brigade was engaged more than 20 times with NATO antiradiation missiles without any effect. The decoys absorbed all the damage. Using such innovative techniques, his brigade was credited with shooting down two NATO aircraft, including a stealth F-117, and damaging another.25

The lessons of the Kosovo War were not lost on our adversaries; the Russian army has institutionalized Serbian techniques. While Serbian weaponry was a quarter-century behind, the state-of-the-art A2/AD zones in Russia and China are equipped with modern systems. To provide concealment and deception, the Russian army has created the 45th Engineer-Camouflage Regiment. This formation is tasked with camouflaging targets so they cannot be found and creating dummy targets that divert an attacker’s fire power.26 The Russians make extensive use of inflatable decoys. Their dummy tanks can be transported in two duffel bags, resist minor shrapnel damage, and incorporate radar-reflective coating.27 It is suspected that a battery-powered heater can be used to generate a heat signature. It appears that this technology was tested in Syria with satisfactory effects.28 The regiment not only hides formations; it can also disguise an installation and build a fake airfield in 24 hours.29 In addition to setting up decoys and disguising physical targets, the formation has capabilities to simulate radio and radar emissions for full-spectrum deception operations. When combined with constant shifting of forces around the battlefield such as moving aircraft between airfields and patches of highways, these tools can be highly effective.

Systems deployed by formations such as the 45th regiment are not capable of complete deception, especially against higher end space platforms, but they do not have to be. They are designed to defeat tactical-level collection platforms such as the microsatellite ISR described earlier. The problem with national-level collection platforms is that there are few of them and they are tasked to support national- and strategic-level targets, not tactical operations. The small number leaves them vulnerable to enemy antisatellite systems.

Another technique is to make **all systems** look alike. The proliferation of standardized containers for international shipping is making the camouflage of weaponry even easier. Recently, both Russia and China have introduced antiship missile launchers that are disguised as containers.30 Northrop Grumman has also investigated this technology.31 As space-based ISR becomes more resilient and robust, we can expect all vehicles to start looking the same. The attackers will have no way of knowing if the observed truck is carrying a deadly antiship missile or hauling humanitarian supplies to a refugee camp. By making all targets look the same, the defender can degrade the effects of enemy fire power and protect his **key defense** systems.

A defender’s techniques are not all powerful and will not prevent an attacker’s penetration of the A2/AD zone. Once key U.S. systems are converged, penetration of the A2/AD zone is possible. A strike package would consist of EW protection and attack aircraft to jam radars and incoming missiles, **cyber attack** to disrupt the enemy network, and ground- and sea-based long-range fires to disrupt enemy ADA and airbases, all timed to allow strike aircraft to **penetrate** the A2/AD zone. A defender’s deception operations and the survivability of his formations will degrade the effects that the penetrating strike force has, while attacking platforms are engaged by state-of-the-art air defenses. The attacker will penetrate the A2/AD zone and destroy targets but at much higher cost and increased duration of the conflict.

Conclusion

Attempts to penetrate an A2/AD zone of a near-peer competitor are possible, but at high cost and over a prolonged conflict. By utilizing space- and aerostat-based **ISR**, a defender gains a **nearly indestructible** early warning system. It can protect his ground-based search radars while maintaining situational awareness. EW reconnaissance systems and high-power computers can distinguish decoys from real aircraft. This degrades the attacker’s situational awareness because the defending battery no longer emits until it is ready to engage real targets. The real defenses are camouflaged, and realistic decoys are set up to draw fire away from defensive systems. The attacker is then engaged from unexpected locations by modern air defenses, including long-range surface-to-air missiles and fixed-wing fighter aircraft.

The defenders will fight in a decentralized manner. Also, a defender’s higher headquarters will allocate ADA and antiship assets and allow them to fight on their own with direct access to early warning networks. The higher headquarters will likely retain control of defending air assets and allocate targets for their own long-range fires, but the bulk of the fight will be in a decentralized manner. This will make dis-integrating enemy defenses difficult because C2 centers will not affect the fight to the degree seen in previous conflicts. Destroying the defender’s C2 nodes will degrade but not dis-integrate the defense. Furthermore, the enemy will likely regenerate damaged C2 nodes, while networked communications will continue to function unabated due to multiple connections and non-C2 nodes that carry the same traffic.

Penetration and degradation of an A2/AD zone is possible through converging key systems across all domains. The real challenge lies in dis-integration of the A2/AD zone. It is important not to underestimate the resilience of enemy networks and their ability to reconstitute damage inflicted by U.S. fire power. At the strategic level, failure to gain quick victory via dis-integration of A2/AD zones will result in a war of attrition, a contest that may not be won at a politically acceptable cost, ending the conflict in a peace settlement favorable to the adversary. JFQ

**Solvency---AI**

**The more data the better.**

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In the more immediate term, however, AI would be most useful for **early warning**, especially with respect to the monitoring of social media, energy flows, or even encrypted communications between Russia and sources inside the Baltic countries. Consider how AI could help **bolster Baltic defences** in such a way as to defeat, if not to prevent, some of the tactics that Russia used against Ukraine in its annexation of Crimea in early 2014. Recall that so-called “little green men” — military personnel bearing no insignia or other identifying marks — suddenly appeared in Crimea manning checkpoints, clearing areas, and intimidating members of the local population in the run-up to the independence referendum that Russia used to lend legitimacy to its effort. The Baltic countries fear that Russia might attempt something similar against them, not least because — especially in the case of Estonia and Latvia — their populations contain Russian-speakers who may sympathize with the Kremlin enough to do its bidding.55 One measure that they have taken is to practice retaking sites from paramilitary forces of unknown origin.56

AI is useful for such situations because the Baltic countries have **home-field advantage**. As such, they can **amass data on** certain environments and sites most **at risk** of being targeted by Russia. Such data could thus be used to understand **regular patterns** of behaviour of individual contained within those environments, thereby offering **earlier detection** and warning in the event that something untoward or **irregular** is happening. Of course, this technology is not impervious to countermeasures. Algorithms could be vulnerable to a battery of malicious queries by adversaries, leading those very algorithms to make faulty or bad predictions.57

As for 3D printing, the Baltic countries could benefit in at least two ways. To begin with, observers believe that because they face such a massive imbalance of power, the Baltic countries should not prepare their armed forces for fighting set-piece battles with the Russian military. Instead, they should prepare to wage an insurgency campaign designed to make themselves difficult to swallow and to occupy.58 Because 3D printing might reduce supply chains, violent organizations may be able to make their own weapons or weapons parts. 3D printed guns have so far proven to be unreliable, but as one Deloitte report warns, 3D printing “can help terrorist groups not only acquire new weapons or capabilities, but also allow them to do so more rapidly and stealthily than before, across a wider range of locations.”59 This can apply equally to insurgent groups, with such capabilities being homemade firearms and improvised explosive devices. 3D printers are not impervious to countermeasures, however. A RAND study cautions that 3D printers — if they are connected to the global internet — can be susceptible to sabotage if a malicious actor hacks into the system and encodes a flaw into the designs of a product that would be printed.60 Moreover, if Russia could mass firepower and saturate hostile environments by using killer robots, then the advantage gained from 3D printing weapons could be offset. Finally, 3D printing could allow forward deployed forces — like the NATO battlegroups stationed on Baltic territory as part of the alliance’s “Enhanced Forward Presence” — to buy more time before reinforcements arrive. They can replenish themselves “on the spot” without relying too much on supply chains and logistical tails. Such additional time could help if Russian aerial and naval assets located in Kaliningrad complicate NATO efforts to enter, and to move within, the theater of operations if war were to erupt.61

Conclusion

Some security analysts argue that the introduction of emerging technologies on the battlefield will have a transformational impact on international security. Military robots, AI, and additive manufacturing (3D printing) could allow non-state or weak actors to level the playing field with more powerful countries. Yet the preceding discussion suggests that a more tentative attitude is appropriate. In the long-term, the impact of these technologies could be dramatic. However, in the foreseeable future at least, the changes generated by these technologies will be gradual, if not modest. Their significance for Baltic regional security will remain limited despite Russian investments in military robotics and AI. Nevertheless, AI holds some promise for the Baltic countries, especially if it enables them to improve their early warning capabilities so as to thwart “**little green men**” scenarios.

This essay offers some policy implications for NATO to consider. First, the **U**nited **S**tates, the **Baltic** countries, and their fellow **allies** should be mindful of how these emerging technologies might affect **interop**erability. If progress in robotics, AI, and 3D printing will be more evolutionary than revolutionary, then the development of these technologies could produce further **capability gaps** between the United States and its NATO allies. **Buying American** might help prevent a **greater widening** of those gaps, but European countries — especially those in the Baltic region — will need to invest in their own research and development (R&D) so that they can tailor these technologies to their own needs.62 Indeed, capability gaps could develop **between** the Baltic countries. Since Estonia may already be ahead of the curve, Latvia and Lithuania could find themselves lagging too far behind. Capability gaps could create gaps in **coverage** if AI has the potential for enhancing early warning.

Second, because AI draws on deep learning methods to improve prediction, **more data** would allow for a **more robust** understanding of trends and behaviour patterns. NATO’s new Baltic-focused regional command could provide a clearinghouse of the data drawn from individual allies. Of course, European allies have already agreed to a Declaration of Cooperation on AI in order to share information and to foster research and development links. Yet the regional command can focus on the peculiarities of the Baltic security economy and exploit economies of scale. This regional command can offset the risk of stove piping between the three NATO Centers of Excellence in the Baltic countries. The one in Riga focuses on strategic communications; the one in Tallinn addresses cyber security; and the one in Vilnius is dedicated to energy security. Although these centers of excellence should preserve their specialisations, they admittedly work on overlapping areas and AI is most effective when algorithms crunch the **largest amount** of relevant data possible. Indeed, another advantage of **data sharing** and **aggregation** is to reduce the possibility of **bias** and to improve the **quality** of algorithms.

Third, emerging technologies offer no “absolute weapon,” since countermeasures are possible. This could be both good news and bad news. For example, if Russia leans too heavily on military robotics, then it would face new problems that manned systems might not have to confront. Latvia has many forests, but it also has marshes and swamps like the Teiči State Reserve in its east. This terrain would already be difficult for military robots to overcome without further intervention. Russian RPAs might also be vulnerable to man-portable air-defence systems. If Russia comes to rely on AI for military purposes, then it might be susceptible to hacking and manipulation. NATO should also heed these issues. Hence the importance of regional cooperation: no one country should find itself a potential **weak link** that can be exploited.

**Solvency---DoD Key**

**The DoD is key to interoperability and training in the Baltics.**

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Russia’s war in Ukraine has generated a **new sense of urgency** in providing security assistance to Europe.

President Biden recently announced another $33bn request to Congress – which Democrats hope to raise to nearly $**40bn** — to support military, economic, and humanitarian assistance to Ukraine, as well as broader security assistance in Europe. This funding underpins the US and NATO’s efforts to **reset** their long-term force posture to adapt to Europe’s new security reality. After 30 years of disarmament, there is much to be done.

As part of this reset, the US should **dedicate more** security assistance to the Baltic States – three strategically important allies on the frontlines of freedom in Central and Eastern Europe. All are EU and NATO members and each spends more than the stipulated 2% of GDP on defense. They are adamant defenders of democracy, supporting Ukraine and Belarus both politically through rhetoric, and practically with security aid. Still, they lack core defense capabilities of their own. This is where the US can help.

US security assistance and cooperation programs are an investment in the transatlantic community’s shared future. They are beneficial for several reasons.

Such efforts make the US safer by **empowering allies** to do more to defend common interests in Europe. Put simply, the more the US does to strengthen Baltic capabilities now, the stronger our **collective deterrent** against Russia’s **future aggression** will be. This reduces the possibility that the US and its allies will be forced to fight a **broader war** in Europe.

They are a force multiplier for other national contributions. For instance, between 2015 and 2020, every $1 allocated by the US taxpayer in Baltic security assistance was matched by $3.20 from the Baltic taxpayer. This supported capabilities such as Multi-mission Black Hawk helicopters, C4 ISR, large caliber ammunition, joint light tactical vehicles, and air surveillance.

Security cooperation also **enhances interop**erability. Providing **standardized systems** (and funds for them) ensures that the equipment of one ally plugs into **everyone else’s**. This way, if the US does need to fight, we can do it effectively and share the burden with allies.

The Baltics currently participate in **several** security assistance and cooperation programs, including the Baltic Security Initiative (**BSI**), which provided $**180 million** for 2022 under the National Defense Authorization Act (NDAA). Yet, there are **several ways** such assistance can be made **more impactful**.

First, more security assistance resources are required to provide the Baltics with capabilities that are **practical**, **affordable**, and **fill key gaps**.

These include:

* **a**ir and **m**issile **d**efense systems, which are woefully insufficient in the region;
* artillery and ammunition, which have proved critical to Ukraine’s fight against Russia; and
* **ISR** (Intelligence, Surveillance, and Reconnaissance) tools that enhance **situational awareness** of **multi-domain** threats and help the alliance build a **shared threat picture**. These capability priorities must be **aligned** across the US and all three Baltic States.

Second, funding for security programs in the Baltics could be extended to **multi-year** timelines to provide more **predictability** and **sustainability**. Because many security assistance resources are assessed and adjusted annually as part of the NDAA, by the time money is appropriated, the timeline to utilize them each year shrinks to roughly nine months. This makes it difficult for recipient countries to deliver meaningful projects and impedes longer-term planning.

Building on the security assistance efforts already provided to Ukraine, the US should consider adapting such programs to contain more predictable multi-year funding. These programs should apply not only to the Baltic States, but also to other vulnerable countries in the region, including Georgia and Moldova. The Baltic Defense and Deterrence Act, introduced in the House and Senate in early 2022 but not yet adopted, would prove a useful step in this direction. It would codify the current BSI and create a complementary initiative at the State Department.

Third, security cooperation can be made more effective through **technical adjustments**. The **D**epartment **o**f **D**efense should prioritize filling all positions in the Defense Attaché Office (DAO) and the Office of Defense Cooperation (ODC) at each US embassy in the Baltics with officers of the **appropriate rank** and **training**. To help facilitate meaningful security cooperation, it should ensure these assignments come from the US military service **most relevant** for that country’s capabilities and the US objectives for that Host Nation.

Fourth, the **speed of delivery** of security cooperation should increase for major capital equipment items (e.g., artillery, air defense, tanks, and aircraft.) As evidenced by Russia’s unprovoked invasion of Ukraine, European allies need access **right away** to the tools and resources that will prepare them to combat potential threats from Russia **tomorrow**. Often **major slowdowns** in security assistance and cooperation programs occur in the contracting processes and production timelines.

The **D**epartment **o**f **D**efense, defense industry, and **allies** can address this by:

* **training** and **developing** the professionalization of ally and partner acquisition officers, along with associated decision-makers;
* demand shorter turn-around times for contract negotiations; and
* treat even small acquisition efforts as strategically important to US security.

The **whole transatlantic alliance** stands to benefit from greater security assistance to the Baltic States, the **frontline countries** of NATO’s eastern flank. By supporting the Baltics, the US can ensure the region is **prepared** and **ready** should Russia attempt any **further aggression** in Europe – whatever the outcome of the war in Ukraine may be.

**NATO’s Baltic exercises deter and assure.** Crimea thumps disads.

**Banka** and Bussmann **6-17** [Andris Banka, postdoctoral researcher at the Interdisciplinary Centre for Baltic Sea Region Research (IFZO) in Greifswald, Germany. He holds a Ph.D. in Politics and International Relations from the University of Birmingham; Margit Bussmann, Chair of International Relations and Regional Studies at the University of Greifswald. She is currently focusing her research on security and cooperation in the Baltic Sea region; 6-17-2022; "Uncomfortable neighbors: NATO, Russia and the shifting logic of military exercises in the Baltics"; *Defence Studies*; https://www.tandfonline.com/doi/full/10.1080/14702436.2022.2089657; KL]

ABSTRACT

To what ends do allies employ military exercises? In order to further our understanding regarding the logic and utility of military drills, this paper focuses on NATO’s eastern flank. Specifically, with the help of **newly compiled** data, we tracked **two decades** of exercises in the Baltic states. Our analysis speaks to the fact that the size, tempo, and character of military training events in this region have manifestly changed. In the early 2000s, military drills were primarily conceived as a mechanism to modernize Baltic armed forces and ensure their adequacy to NATO membership standards. The 2014 **Crimea** crises, however, dealt a serious blow to the regional order. This event was the primary driver behind a **considerable spike** in the overall exercise numbers. At the same time, we observe that it was not only a mere quantitative shift that transpired. From parachute drops into remote areas, rehearsals of river crossings to moving of combat power via narrow land corridors, the staging of military exercises after 2014 were overhauled into events that accentuated NATO’s reinforcement capabilities. In this context, military exercises can be seen as a **crucial element** to **credibly signal capacity** and **resolve** within the concept of deterrence by reinforcement.

Introduction

Military exercises can serve a **number of purposes** ranging from tests of **interop**erability and **readiness** to **geopolitical signalling**. States can use such costly signals to reveal their military power and to send signals of resolve to use it with the intent to deter potential aggressors but also to reassure alliance partners of their support. Depending on the geopolitical climate and the perception of threat these signals can be more or less pronounced and their logic can prioritize one purpose over another. In times of relatively harmonious regional cooperation military exercises presumably follow predominantly more peaceful aims such as testing interoperability and building further trust, whereas more conflictual times with high mutual distrust and threat perceptions lend themselves to geopolitical signalling and a deterrent logic while continuing to practice and develop interoperability.

In the past years, military exercises have **regained their salience** as essential tools of statecraft. Nowhere has this been **more pronounced** than in the **B**altic **S**ea **r**egion, where both NATO and Russia have organized their **largest training events** since the end of the Cold War. In order to further our understanding regarding the logic and utility of military manoeuvres, this paper focuses on NATO’s eastern flank. Specifically, with the help of newly compiled data, we have been able to track two decades of allied military drills in the Baltic states, evaluating their objectives, involved scenarios and messaging efforts that surround them. The peculiar positioning of Estonia, Latvia, and Lithuania – sitting on a geopolitical fault line, provides us with an ideal opportunity to gain deeper insights into the value of allied military exercises.

Our analysis reveals how at different time periods exercises have been employed to support various political and military objectives. Mirroring the changing security landscape, the size, complexity, and logic that underpins such exercises have shifted considerably. In the early 2000s, military drills were primarily conceived as a mechanism to **modernize** Baltic armed forces, ensure their **adequacy** to NATO membership standards and prepare personnel for out-of-area operations in the Middle East and Balkans. For a brief period of time, maritime exercises in the Baltic Sea further served as a rare venue for engaging the Russian senior military leadership. A deteriorating regional security environment, however, elevated military drills on whole another level of importance. Russia’s forceful takeover of territory from its neighbour Ukraine in 2014 was a critical juncture that instantly prompted a change in perceptions about Moscow’s intentions. As a result, the number of military training events across the Baltic republics spiked. At the same time, we observe that it was not only a mere quantitative change that transpired. Upon closer inspection of individual exercises in the Baltics, we identify a clear paradigm shift as to their overall mode of function.

Whereas previously exercises primarily served the purpose of preparing Baltic armed forces for far-flung combat areas, the bulk of military exercises in the post-Crimea era “turned inward.” Having studied the lessons of Ukraine, scenario scripts were flipped over and directed towards the defence of Baltic cities, roads, airfields, and seashores. Allied exercises in the Baltics essentially became an interlocking element between already pre-positioned, but very limited multinational troop deployments in the region, and much larger follow-on forces. In this context, the purpose to practice and enhance interoperability and testing new equipment became a **central aim** of military trainings given the increasingly **multinational** character of NATO presence and reinforcement. From the vantage point of NATO, military manoeuvres on the alliance’s eastern flank formed a **critical facet** of the overall deterrence posture as they aimed to convey that, despite Russian advantages in force ratios and geography, the alliance would be able to move fast in a crises situation in support of its treaty allies. Stated differently, by organizing exercises on the basis of swift movement of forces, NATO aimed to establish deterrence by reinforcement.

The rest of the paper proceeds as follows. The first section briefly surveys theoretical underpinnings of why states exercise. Subsequently, the paper lays out the curious geopolitical context in which the Baltic states find themselves and the impact that this may have had on NATO’s adopted deterrence posture and implemented exercises. Following that, we present our research design, data gathering methods, and used sources. With the help of our data collection, the paper then proceeds to outline the general patterns of military drills across the Baltics. Next, the analysis offers a more granular assessment of selected military exercises: Baltops, Saber Strike, and Spring Storm. This allows us to make the case that a substantial shift has taken place not only in terms of overall exercise numbers in the region but also concerning their underlying objectives. The article concludes with a summary of the key findings and identification of possible avenues for future research.

Why states exercise?

Current scholarly literature offers multiple explanations for why actors conduct individual and allied military drills. To begin with, military manoeuvres figure prominently in classical works of deterrence, which can be defined as “the use of a threat by one party in an attempt to convince another party to refrain from some action” (Quackenbush 2015, 2). In order to deter an opponent, an actor must be in possession of certain military capabilities. Hard power **alone**, however, does not deter. Physical capability **must be combined** with credibility, which in Morgan’s (2003, 15) terms is “the quality of being believed.” Simply stated, an opponent must believe that the defender will **follow through** on its announced threats to use force in order to protect its interests in question. Signals about foreign policy interests and the willingness to use force are more credible if costs are attached (Fearon 1997). Financially quite costly military exercises can credibly communicate a resolve to employ force. Joint exercises can be considered as one of the **foundational elements** for reinforcing credibility behind mutual defence commitments (Bernhardt and Sukin 2021, 859).

Military drills can be **particularly salient** in instances of **extended** deterrence, a type of deterrence that involves more than two parties. In the academic literature, extended deterrence is viewed as “inherently less credible than direct deterrence” (Davis et al. 2019, 6). This is due to the fact that allied partners are often located “thousands of miles away and often much closer to the territory of the aggressor state” (Mazarr 2018, 2). As Stephen Walt (2021) posits, attempting to deter attacks on one’s own soil is by definition more credible, whereas extended deterrence is a more demanding task. In this context, regular military training events with a partner government may be utilized in order to convey a message to the opponent about one’s willingness to sacrifice own soldiers in order to defend an ally under a military threat. In particular, if allies are far away, military exercises can also be used to signal the logistical capabilities to deploy troops quickly over large distances. In their study of various signalling devices that major powers can use to assure support to a protégé, McManus and Nieman (2019) identified joint military exercises as the most important signals of support. Military exercises factored **before** other signal types, such as arms transfers and **troop deployment**.

The purpose of military exercises, however, goes beyond mere deterrence and assurance efforts and has been linked to other strategic goals. According to Wolfley (2021), governments can also initiate joint military exercises as a means to recruit partners to join multinational war-fighting coalitions. To illustrate this with a concrete example, NATO’s Partnership for Peace program served to intensify bilateral links between individual nations and NATO while equally preparing them for potential peacekeeping missions in the Balkans and the Middle East (p. 6). In addition, the undertaking of military exercises can be used as a trust and confidence-building measure among rival powers. Training side by side, proponents claim, holds the promise of lessening uncertainty about each other’s capabilities and intentions, thus helping to steer clear of the classic security dilemma scenario (Chau 2011, 57).

Multinational exercises can also be instrumental in honing **allied interop**erability, **mutual understanding**, and **communication**. Here, it is worth stressing that even states that belong to the same military organization tend to have **distinct** command styles, doctrine, and equipment. One important **institutional asset** of NATO is its multinational **integrated military command** and the interoperability of its member states’ national militaries. Over the years **regularly recurring** exercises helped to build up not only specific assets against a Soviet threat but more general assets for **decision-making** and **planning** with procedures and structures that could serve other types of missions adding to NATO’s **persistence** and **adaptability** to changing security environments (Wallander 2000). Refining interoperability, however, is an **ongoing process**. This is **particularly** the case due to NATO’s absorption of **new member states** in 20**04**.

Some of the previous NATO deployments involving troops from multiple countries have brought to the fore issues of incompatible military equipment, lack of adequate English-language proficiency and cultural complexities (Tresch and Coops 2007). To alleviate such problems, regular exercises may serve as means for integrating otherwise diverse military compositions. In addition, multinational exercises are credited for having certain socialization effects whereby common military drills help actors to identify mutual threats and share processes of how to address them (Frazier Derrick and Hutto 2017, 380).

On the other side of the spectrum, military exercises can also serve as a cover for an invasion. Historically, countries have frequently employed exercises as a disguise for a surprise attack on the enemy (Betts 1982). In this context, it is useful to recall that in 2014 Russia first utilized snap exercises in order to move its forces near Ukraine’s border, part of which eventually were deployed for the actual invasion of Crimea (Kofman 2017, 24). A similar scenario played out in February of 2022 with Russia initiating large and protracted military exercises in Belarus and on the borders of Ukraine. Eventually, the Russian forces that were supposedly on a training mission then switched to attempts to take over and occupy large parts of Ukraine. If perceived as threatening, military exercises can also provoke a reciprocal signal of resolve by the adversary, especially if the exercise is large and takes place in proximity (Bernhardt and Sukin 2021). The potential for conflict escalation, however, is smaller if the manoeuvres are conducted within an alliance (Kuo and Blankenship 2021).

The size, location, and frequency of the exercises vary considerably. Training may be carried out in domains such as land, sea, air, cyber, and space. Such events may be open to international monitors or take place behind the veil of secrecy. Moreover, it must be stressed that military exercises are not cheap to organize and execute. Even the preparation stage, Lasconjarias (2020) submits, can be a time and resource-demanding event. In sum, military exercises fulfil multiple functions and can be applied to buttress numerous political and strategic objectives. The aims and priorities of military exercises can change over time depending on shifts in the geopolitical order. They can serve the purpose of sharpening interoperability among alliance partners or be used as confidence and trust-building mechanisms among opponents. By the same token, however, exercises can be utilized as a measure of deterrence or coercion.

In this article, we propose that NATO military exercises in the Baltics, while characterized by continuity in their endeavour to practise interoperability, at the same time underwent major changes in their aims. Mirroring the changing geopolitical conditions, they have evolved through two distinct phases. Initially (2000–2014) they supported the goals of modernizing Baltic armed forces and preparing personnel for foreign missions. After 2014, however, allied exercises morphed into a critical tool for making deterrence credible. In particular, they served as a mechanism to demonstrate the alliance’s capability to quickly reinforce its enhanced Forward Presence units.

Exercises and deterrence by reinforcement in the Baltics

In this study, we have chosen to scrutinize military exercises in the three Baltic states: Estonia, Latvia, and Lithuania. Why focus on this specific geostrategic area? We posit that this space, due to its proximity between rival actors, lends us an opportunity to gain important insights into the value and utility of allied military exercises. To put it at its simplest, the structural conditions present in the Baltic Sea region make this area an intriguing object for an academic inquiry. After all, this is where the Western security architecture (NATO) and the Russian Federation psychically meet each other.

The outer edge of NATO and the Russian western border has long been marked by analysts as a geopolitical fault line. Both Baltic and Russian authorities have regularly expressed their discomfort of being in close physical proximity to each other. In this context, scholars like Ralph Clem (2018) have advanced the argument that by ratcheting up the number and size of military exercises, both NATO and Russia are risking greater geopolitical instability. This notion, however, has been countered by the work of Kuo and Blankenship (2021) who suggest that exercises that are conducted within military alliances **do not** create the type of escalatory dynamics that critics have warned about.

As NATO’s easternmost members, the Baltics share considerable borders with what they perceived to be a threatening revanchist power. These countries are almost completely cut off from their NATO peers. Only Lithuania shares a thin stretch of land, commonly referred to as the **Suwalki gap**, with fellow alliance member Poland. In the view of Riho Terras, a former Estonian Chief of Defense Forces, the Baltics are “**like an island**” due to the fact that the gap between pro-Moscow Belarus and the Russian enclave Kaliningrad is negligible (cited in Jones 2016). Kaliningrad itself poses a significant challenge as it gives the Russian side an additional platform for power projection into the Baltics (Nieto 2011).

Being **sparsely populated**, the Baltic republics are not in a position to mount a defence purely by own means. Thus, in strategic matters, they are **heavily reliant** upon NATO partner governments’ promise to protect them. In this context, academic scholarship abounds with references to the Baltics as the alliance’s most exposed link. Sceptics have even implied that territories located in Europe’s deep corner are outright indefensible militarily. In the view of Barry Posen (2021), the defence of the Baltics is not a practical matter due to their unfavourable geography. In its immediate neighbourhood, the Russian Federation is by far superior in terms of conventional military force as well as holding an advantage in the geographic set-up (Veebel 2018; IISS 2021). What is more, Russian military capabilities are considered to be most formidable and advanced in its Western Military District. Certain war-gaming simulations have concluded that Russia, in a hypothetical scenario, could overwhelm and overrun the Baltics in a matter of few days (Shlapak and Johnson 2016).

In hindsight, with the Russian armed forces struggling tremendously in achieving their war aims in Ukraine despite outnumbering their opponent by a significant margin, analysts have been forced to rethink their baseline assumptions about the “defensibility” of the Baltic states. As put by one of the lead Russian military experts Michael Kofman, the Ukraine war has proved that the Russian military is not exactly “twelve feet tall.” That, Kofman advises, however, **should not** lead us to the **other extreme** whereby we assume that it is “four feet tall” and incapable of operational success in a **different setting** (cited in Chotiner 2022). One ought to bear in mind that by their **territorial size**, **population**, and the number of **active-duty troops**, the Baltic states and Ukraine are in **entirely different** categories.

Tellingly, Baltic officials themselves have also talked about being entrapped in an “uncomfortable geography” (Larter 2019). In the words of former Estonian Minister of Foreign Affairs, “while NATO collectively is far superior to Russia […] there is one corner where Russia enjoys local advantage and that’s the Baltic Sea region” (Mikser 2018). During relatively harmonious geopolitical climate, Baltic geographic disadvantages as well as Russia’s upper hand in local conventional force ratios, have largely been a non-issue. In the immediate aftermath of the Ukraine crises, however, as the Baltic region became a focal point of tension between Russia and NATO, geographic considerations, in Mattelaer’s (2018, 346) telling, “returned with a vengeance.” Similarly, Studemeyer (2019, 789) points out that while the Baltic “geographic position on NATO’s eastern periphery was of little concern in a post-9/11 world,” the annexation of Crimea visibly changed the importance that was accorded to NATO’s eastern flank.

The Baltic strategic predicament created a considerable dilemma for NATO. On the one hand, the alliance was unwilling to recreate a Cold War-type of deterrent with massive troop numbers facing each other. On the other hand, the deteriorating security landscape called for a credible deterrence posture on its eastern flank. The solution, at least in part, was found in regular allied military exercises. To begin with, as part of NATO’s effort to bolster its presence in the East, allied governments in 2016 agreed to implement the enhanced Forward Presence model – an innovative force structure consisting of a diverse group of nations. While a historical milestone for the alliance, the deployment of roughly 5500 NATO troops in the Baltics and Poland did not, however, appreciably alter the balance of power in the region. In itself, forward-based tripwire forces across the Baltics are clearly not in a position to deny Russia its military objectives.

By **any measure**, Moscow still retains **notable quantitative** and **qualitative** superiority in the region. Rather, the task of these limited forward-based units in a hypothetical Russian advance scenario would be to buy time and delay its advance until the arrival of larger NATO forces (Lanoszka and Hunzeker 2016). As elaborated by the Estonian Defence Minister, the enhanced Forward Presence model should be viewed only as “one piece of the puzzle,” that is connected to the “reinforcement strategy, the goal of which is to ensure the rapid arrival of allied forces in the Baltic states” (Estonian Ministry of Defence 2018). In such a set-up, we suspect that regular military exercises after 2014 more distinctly contain core elements that signal the alliance’s capacity for swift movement of forces and reinforcement. Such exercises can thus be considered an **anchor point** for making deterrence credible.

Baltic exercises over time

In order to capture the key patterns regarding exercises, we collected empirical data covering military drills in the Baltic states between the years 2000–2019. This time period includes the years before the Baltic states’ NATO accession and ends before 2020 when major exercises were cancelled or notably limited due to the Covid pandemic. As it pertains to data collection on military exercises, one has to acknowledge that it is fraught with challenges. The only available global data collection on joint military exercises (D’Orazio 2013) that we are aware of ends in 2010. In a comparison of Russian and NATO military manoeuvres (2015–17), a group of Frankfurter Allgemeine Zeitung journalists relied mostly on press releases to assemble a systematic overview. In doing so, the lead author (Hemicker 2017) points out that because there are no readily available overviews of such exercises, the “data must be assembled from hundreds of pieces like a mosaic.”

Here, we followed a similar approach by marshalling empirical evidence from the following publicly available sources: Baltic News Service (BNS), annual NATO reports on allied exercises and the official website of the Lithuanian Armed Forces. We relied on an automated keyword search (“military exercises” and “military manoeuvres”) in LexisNexis for the Baltic News Service, the region’s leading news wire, to identify relevant articles which we then screened manually to identify the ongoing manoeuvres. Our data collection encompasses 72 military exercises that took place in the Baltics at land, sea and/or air. This includes exercises that are repeated annually as well as exercises that are nonrecurring. A list of the identified exercises can be found in the online appendix.

We have counted only those military exercises that are multinational in nature. That is to say that at a minimum two NATO members had to be involved in the military drill for it to be included in our analysis. As part of the data gathering process, we sought to establish the name of the exercise, location, size, participating countries as well as estimated troop numbers. For our research purposes, we counted only those events that involved at least 1000 participants. Following the example set by Castillo (2016), we chose this particular cut-off point due to the fact that an exercise of this magnitude would likely be reported in the press.

To get a better handle of the role that military exercises play in the region, we further fused quantitative data with in-depth qualitative analysis. To that end, we have scrutinized **public statements** and **strategic documents** by **NATO**, **Russia**, and the **Baltic** states. Consequently, we have been able to better assess the driving logic behind military exercises in the Baltics. Our presented findings serve to fill a **notable void** in the academic scholarship. While a number of scholars and policy analysts (Brzezinski and Varangis 2016; Norberg 2018; Ploom et al. 2020) have made important strides in exploring the topic of military exercises in the Baltic Sea region, such studies have focused either on a selection of individual large exercises, or they have covered a maximum of 8 years of exercises in the region.

To date, **no systematic analysis** has yet been presented that thoroughly maps and assesses **two decades** of exercises. Without **systematic data** collection and **in-depth** analysis, we risk drawing conclusions that suffer from **selection bias**. Relying on very few exercises or a short time can be **misleading** indicating a shift in patterns where there might only be an outlier. Our contribution is to investigate how military exercises in the region evolved over time and whether key international events had a large and enduring impact in the pattern of joint trainings. By grounding our analysis in a longer time period, we are able to develop a **richer understanding** of the role that military drills have played in the Baltic Sea region and how they have changed over time. Moreover, our contribution goes beyond capturing the size and frequency of exercises. We furthermore assess the character and scripts of military exercises and thus add more detail, again in particular with a focus on how they changed over time.

In the first step, we present some descriptive patterns of the military exercises in our data collection. Graph 1 reveals that military exercises in the Baltics took a different course after the annexation of Crimea We can see a clear spike in the frequency and size of military exercises. Graph 1a provides us with an overview of the number of joint military manoeuvres that were performed in the Baltics per year. Up until 2012 we observe typically one or two military exercises per year, with a certain increase after 2010 to three and even four exercises per year in 2013. In 2014, the number of joint exercises that took place in the Baltics doubled to eight and remained high until 2019.

**[GRAPH 1 EXCLUDED]**

Military exercises did not only take place more frequently after 2014, they also increased in size. Graph 1b portrays the average size of a military exercise in terms of participating troops on a monthly basis. Until 2014, military drills were held on a rather regular basis usually in May or June. The average size of a manoeuvre in the early years of our period of study was about 3,000 (2,927) ranging from 1,000 (the minimum size to be included in our data collection) to 6,000 participating soldiers in the Steadfast Jazz exercise in October 2013. After the annexation of Crimea, military exercises took place with far greater frequency, spread over more months in a year and also increased in size to an average of almost 5,000 (4,798) troops. The largest exercise in our data collection with 18,000 troops is Saber Strike 2018.

In the early 2000s, military exercises in the Baltic states primarily served the purpose of preparing these nations to meet the alliance’s technical standards as well as readying them for missions in the Balkans, Afghanistan, and Iraq. State officials regularly framed exercises with allies as opportunities to modernize forces and acquire new skill-sets. Commenting on a multinational exercise Baltic Eagle 2000, Estonian President Lennart Meri stressed that these types of activities help the nation to gain “sound and intelligent administrative experience and modern military training” (Meri 2000). After the Baltic states’ NATO accession in 2004, our data does not reveal much change in the pattern of exercises. In 2005, the Lithuanian Ministry of Defence emphasized that the guiding objective of exercising with partner governments has been to “to develop interoperability among NATO and PfP forces and to improve multinational unit command and control in NATO-led Peace Support Operations” (Lithuanian Ministry of National Defence 2005).

The Baltic states were highly concerned with the developments in Georgia in 2008. Relations between Russia and NATO became increasingly strained. NATO reacted to the Russian military invasion in Georgia by suspending military and political cooperation; in turn, Russia suspended its participation in military exercises and other cooperation but continued logistical support for NATO’s Afghanistan mission (Forsberg and Herd 2015). In the graphs above, the Georgian-Russian war did not leave a pronounced mark on the number and size of military exercises conducted in the Baltic states. The number and size of manoeuvres remained relatively stable with a slight increase after 2009. Russia did not participate in the Baltops exercise in 2009 but already joined again in the military training exercise a year later.

The Ukraine crises was a **clear turning point** in NATO-Russia relations. All cooperation was put to an enduring halt. No joint exercises with Russia have been held since. Instead, NATO **increased** its military presence in the Baltic states and beyond. This includes the military exercises in the Baltics as reflected in the graphs. Already in 2014, NATO officials vowed to “establish an enhanced exercise programme with a focus on exercising collective defence” (NATO 2014). Concurrently, the alliance’s **predominant power**, the United States, pledged to increase the number of **multilateral exercises** in the Baltic region (White House 2014). The presented analysis attests that these promises were translated into **tangible action**. NATO, as part of its deterrence posture, put a premium on sharpening the ability to move allied troops and equipment across Europe. To that end, military exercises stressed **readiness**, **speed** of movement, and **compatibility**.

From parachute drops into remote areas, rehearsals of river crossings to moving of combat power via narrow land corridors, the staging of military exercises after 2014 were overhauled into events that, first and foremost, accentuated the alliance’s swift reinforcement capabilities. By probing the character of allied military drills, we find that exercises were scripted and implemented in a manner to convey the message that the alliance can act on short notice and that even the most exposed members on its frontier will be defended. As explained by the former NATO assistant secretary-general, the task at hand for the alliance was to demonstrate that it is in a position to move “forces where they are needed and to move them quickly. And send a signal to a potential adversary that NATO will be ready to defend” (Brauss 2021). Simply put, by directing its attention toward rehearsing a quick response to a potential crisis in the Baltics, NATO used exercises as a means for establishing deterrence by reinforcement.

Beyond communicating that the alliance can **rapidly move** military fighting power into and within the Baltic operational area, military drills have also been **instrumental** in **sharpening interop**erability among **multinational deployments** in the region. Shortly after the setting up of the enhanced Forward Presence model in 2017, these forces were incorporated into various NATO training schemes, primarily to ensure that multinational battalions are able to function together as **cohesive units** under the common **alliance’s flag**. Moreover, we find that allied exercises in the Baltics have also served as **important feedback** channels for lawmakers and military planners. While large-scale exercises clearly had a performative dimension to them – an audience for which they were played out, there was also a **very practical** and **educational** side to the regular movement of military equipment and personnel across the European continent. Exercises served as a **testing device** for identifying one’s own **deficiencies**, thus laying the **groundwork** for what needs to be **rebuilt** in the physical infrastructure.

**Solvency---US Key**

**The US is key for Baltic assurances.**

**Veebel** and Ploom **18** [Dr. Viljar Veebel, Fellow on Russian Strategic and Military Studies at the Baltic Defence College; Dr. Illimar Ploom, Associate Professor of Strategic Studies at the Estonian National Defence College; 2018; "The Deterrence Credibility of NATO and the Readiness of the Baltic States to Employ the Deterrence Instruments"; *Lithuanian Annual Strategic Review* Volume 16; https://journals.lka.lt/journal/lasr/article/153/file/pdf; KL]

On the other hand, what one must also see, especially when looking through the eyes of the Baltic leaders, the **major player** in NATO is the U.S. For the U.S., the possibility of not **stepping forward** and retaliating for a violation of sovereignty of NATO members would be an **existential issue**. From this perspective, there appears to be certain minimum levels of coherence. At large, i.e. about NATO in general, this is reflected in joint statements and actions. However, the **core minimum** cohesion of NATO can still be seen to depend on how the U.S. interprets the situation. Would the U.S. be willing to and capable of protecting its allies, even the **smallest ones**? In this context, clearly the main strategy of the Baltics is to fully meet the requirements set by the U.S. and to seek for a special relationship with the U.S.

**Modeling---Sustainability**

**Baltics solve global sustainability.**

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2.2.2 Growing into a green-tech giant. The ecological footprint clear-up

In 2050 green is the new black. Today, in 2050, the **B**altic **S**ea **R**egion is a **global giant** in **green-tech**, where innovation, growth and green technology are in the **epicentre** of work and everyday life. Building on its innovation leader profile of the 2010s (European Commission, 2019b), places in the Baltic Sea Region continue being a worldwide player in innovation, research and green technology, attracting businesses and business angels to invest in the region. Already between 2012 and 2017, the **v**enture **c**apital funding to start-ups with an **a**rtificial **i**ntelligence specialisation grew at a global level by a **compound annual growth** rate of **85%**, while it more than **tripled** between 2016 and 2017 elevating this technology to a **priority** for private investors (European Political Strategy Centre, 2018). This went hand in hand with the 4th industrial revolution and the latest technological advancements, which has shaken the technological progress over the last 30 years. Industrial evolution has been a continuous process in the history of modern humanity. The advancement of technology and innovations have revolutionised the industry and the 4th industrial revolution or industry 4 is now a reality in most aspects of life. Industry 4 incorporates a set of different technological advancements that influence manufacturing, services and everyday life of citizens through a fusion of technologies blurring the lines between physical, digital and biological systems (ESPON, 2019c). The term encompasses the technological trends of **cyber-physical** systems, **I**nternet **o**f **T**hings, **cloud computing**, **cognitive computing** and **a**rtificial **i**ntelligence (European Parliament, 2016) with **robotics**, autonomous automobile systems, **additive manufacturing** are not only **well established**, but also shape the production and consumption patterns. With growth and competitiveness being a primary goal for governments and industries, production is reaching a peak. **Global relations** are boosted so as to consolidate the **B**altic **S**ea **R**egion as a **worldwide tech giant** region. Advanced green technology and innovation turn production ‘**greener’** and limit environmental problems. Due to this, people tend to consume more, resulting in a guilt-free apogee of consumerism.

**Cooling down** the global warming. Climate change was according to a 2017 Eurobarometer report a **serious concern** for the Europeans (European Commission, 2018). Europe had faced a sequence of extreme weather events, ranging from heat waves and droughts to floods and typhoons, with the temperatures above the Arctic Circle increasing. The Intergovernmental Panel on Climate Change reported in 2018 (Intergovernmental Panel on Climate Change, 2018b) that global warming of +1.5°C would have severe consequences on the sea level rise and ecosystems in the world. Such developments have rung the caution bell to adopt stricter climate change mitigation policies, and the European Union put forward a strategy to achieve a climate-neutral net-zero greenhouse gas emissions. In 2050 Europe is a global climate change actions **leader** having reached the goals of the 2018 vision to achieve a net-zero greenhouse gas emissions (based on European Commission, 2018). The **B**altic **S**ea **R**egion became a **pioneer** of this transition, given its **strong innovation** background, which has developed and implemented green technology to address environmental issues. This has been largely supported by both governments and industries, which have seen green innovation and technology as both a means for growth and profit and a panacea for improving the environmental conditions in the Baltic Sea Region and meeting the European and global climate requirements and policies.

• Who is afraid of industry 4.0? In 2050 the 4th industrial revolution is embedded in everyday life in the BSR, where the lines between physical, digital and biological systems are blurred through a fusion of technologies. Cloud computing has revolutionised IT platforms and services, with companies using enterprise or public clouds not only because it is more cost-efficient (European Strategy and Policy Analysis System, 2015) but also for easier data storage and mining, as well as for cryptocurrency exchanges, as the latter functions as the new monetary system. At the same time, AI has brought the biggest changes in the production and economy (e.g. machine learning, text and speech recognition, tailored news and web surfing suggestions). The use of AI has a strong impact on production and consumption. Algorithms can predict what people want to shop, what to watch or read and production and services are tailored according to these needs. Robotics and AI have replaced most of the repetitive production jobs in the BSR, which already from the 2020s had a high risk (of about 70%) of automation (ESPON, 2019a).

• Becoming the **Baltic eco-silicon valley**. Given the commitment of the BSR to achieve by **2050** a **zeroemissions** policy, this **advanced tech**nology has been used and implemented in ‘greening’ the economy. The use of ‘Greentech’ in the BSR has decreased pollution to the **minimum**, reaching the goal of the **zeroemissions** with a **positive impact** on the overall environmental condition of the air and sea of the region. Green technology has been applied both at the production business models, but also in the energy, transport, farming and resource efficiency sectors. This has increased competition of the industries and companies which wish to satisfy their customers and at the same time increase their profits. Such high competition and practices have also increased the greenwashing phenomena in the region, where companies were deceptively marketing their products as environmentally friendly, overall, the implementation of advanced technology in the different production sectors has allowed an almost zero CO2 emissions, resulting in a more massive production and growth.

• Businesses go green and make money. In response to the citizens’ demands and in anticipation of stricter regulations, businesses accelerated their innovation developments for low carbon transition. Business activities range from investing to renewable energies to cutting their own GHG emissions, by adopting new technologies, increasing their operations resilience and contribute to the market of environmental goods (Bartlett et al., 2016a). This move did not only minimise costs, increased the profits and economic growth of businesses in the BSR6 , but also improved the reputation of the companies, as they contribute to **better health** and **environment**, increasing their consumers' loyalty. Nevertheless, phenomena of misusing eco-labels, or scandals around reporting low carbon emissions happen and are hardly traceable.

• New jobs created, new forms awaited. The rise of the AI is not only linked to technological unemployment. Instead, it has been a motor for generating new jobs, adjusting in the new model. Studies from the late 2010s anticipated that new technologies are not only replacing some existing jobs, but also increase them or creating the need for new ones. At the same time, the increase use of technology and online connections also create new forms of employment, where people work rather from distance, in home offices without necessarily being present in an office space. In addition, people may have more quality jobs, allowing them to have time on more important and personally fulfilling tasks (European Commission, 2019a) or engage in voluntary work. To cope with the changes, companies need to be ready for continuous innovations and to adjust. Given the high automation of jobs, the production is also more efficient, more accessible and in full speed, having an impact, first and foremost on the consumer.

• Tailor-made design: a personalised production. AI and wide use of algorithms shape the design of products, which are specially designed according to the needs of people, based on a thorough big data collection and analysis by the companies. This means that every product purchased is tailored to the customer. Already from the late 2010s, surveillance in stores, such as Bluetooth beacons, could track from the location of the customers in the store, which products they prefer, the path they follow in a store, so as to later send targeted advertisements or organise the branding of the shop (Kwet, 2019). Further to this, AI can develop the customers' identity, analyse the purchase history and suggest items that interest the customer, matching his own preferences. Nevertheless, it is not only industries that can offer tailor-made design, but 3D printing also is available in most houses, enabling people printing from clothing, to daily products to office material just at home and recycle them or throw them away when they are not needed anymore.

• E-commerce versus brick-and-mortar. Online shopping is now more accessible, faster and reliable, as products can be tailored to the needs of people, AI can remember previous purchases and provide suggestions that match with the style of the people. This has a consequence in the rather more traditional shops, the brick-and-mortar shops which start losing ground in the BSR. Few that remain are rather the commerce environment. People do their shopping through online services, which are also more tailored to their preferences, from their nutritious needs and allergies to being tailored to their size and preferences. Smaller shops and local productions are gradually disappearing, making local shopping identities harder though creating a more universal consumption profile.

• How do we react? Social inequalities have been a consequence of this transition, especially between skilled personnel who are able to be employed in niche jobs and those which due to the full automation of manufacturing works are unemployed. The state has been responsive, and after several experimental trials, trying already in the 2010s in Finland has developed and issued a universal basic income for all citizens. This universal basic income is generated by the profit gained through the job automation and the taxes imposed globally exposed industries. Especially people fully relying on the universal basic income may invest their free time to social activities or new innovation and patent ideas, given that the civil society and democracy in this scenario is high. Also ageing, in this case, turns into an advantage. First, due to technological advancements, people are healthier and live longer. This means that they can support with taking over different jobs, i.e. be that ‘older’ more traditional jobs, or supporting in the different other activities.

• Hyper consumerism in place. As robots have taken over several jobs for faster and more efficient production and the use of innovation for green technology, an apogee of guilt-free consumerism is observed. In parallel, the 3D printing has allowed for more printing material at home, which, together with high recycling opportunities, makes consumption easier and faster. People have the tendency to consume more and more as everything is more environmentally friendly, and more things get recycled. In that case, we see a link between consumerism and the need to look for more resources becomes necessary due to the large exploitation of the existing ones for production. In response to this resource scarcity, the recycling industry becomes more important, where material from electronic devices to biodegradable goods can be recycled or biodegraded. Especially today, where more research on technologies on using cellulose or lignin to produce plastics, a trend already discussed in 2019 (World Economic Forum, 2019), which allows a more effective recycling, gives higher hopes to people for a ‘guilt-free consumerism’.

• Continuous learning and new skills are vital. The education system has been adapted to the new needs and improved so that citizens are able to meet the skill requirements for the new niche jobs. Being digitally literate is another prerequisite of 2050, where the majority of people are already digital natives, compared the to late 2010s there was a gap of e-skills supply of about 900,000 people by 2020. People need to constantly upgrade their skills and learn throughout their lives to be able to adapt to the different requirements (European Strategy and Policy Analysis System, 2015). They change jobs often, and hence continuous learning is necessary (European Political Strategy Centre, 2017). In that respect, online courses are a key lifelong learning opportunity, at least for the masses who cannot afford more tailor-made and specialised private education.

• **Agriculture** and **natural resources**. Given the focus on growth and mass productions, agricultural production and forestry need to cope with these developments. Green technology allows for **increased production** of crops and vegetables. This is mainly possible **through smart farming**, which uses advanced technology such as **IoT** to manage farms and increase the **quantity** and **quality** of products and optimise the human labour that is necessary for agricultural processes (Sciforce, 2019). In 2050, **genetically modified** crops prevail, so that they can resist pests, grow in the demanding climatic conditions and reduce production losses, through genetically editing the code of crops (World Economic Forum, 2015). Bio and organic agriculture is very limited and hence very expensive; instead, a lot of vegetables and fruits are produced in greenhouses thanks to clean energy, which are built across areas that in the 2010s were not arable. The last decades, citizens favour vegetables based nutrition, reducing their red meat consumption. Trends such as ‘beyond meat’ and veganism prevail, while new food concepts such as insects and bacteria emerge.

• **Transforming transport**. As more products are being produced, transport and accessibility play a vital role in their transportation. Hence transport accessibility is the core of logistics. Through the development of the **cyber-physical** systems, automobiles and **autonomous vehicles** and **drones**, together with the **electric** and **hydrogen** engines, but also **satellite navigation** systems now shape not only the urban mobility (European Strategy and Policy Analysis System, 2015), but such technologies revolutionise also the transportation and delivery of different goods. At the same time, thanks to the clean energy, transport has become **faster** and **cleaner**, allowing for more exports and imports of goods with new technologies used for aviation. Trends already discussed in 2015, such as ‘fuel cell’ cars running on hydrogen are now mainstream, with the latter being clean-burning with only water vapour as waste, reducing air pollution (World Economic Forum, 2015). As a result, there was an increase in the use of cars is also to be observed, given the cleaner fuel technologies. Congestion remains a problem in the urban areas, as the increased efficiency of public transport has not decreased the use of electric and hybrid cars. Furthermore, new transport modes such as solar planes are also being considered and experimented for passenger connections (see as an example from the 2016s, Carrington, 2016).

• **Green Shipping**. In the BSR technology is used for an **emission-free** maritime transport (based on Green Ship of the future organisation, n.d.), for eliminating accidents and improving safety, navigation routes, emergencies, through e-navigation and other relevant technologies (EUSBSR, n.d.). As ports are overloaded with traffic, the role of rail and roads that connect the ports to the mainland has also been increased, creating a transport spillover effect (VASAB, 2018). Shipping, at the same time, is highly dependent on global factors. For instance, globalisation and the increasing international competition for resources, markets and consumers influence shipping in the BSR (Interreg Baltic Sea Region, Baltic LINes, 2018).

• Energy in demand. The increased production and growth require increased use of natural resources, resulting in an increase in energy consumption in the region. Already in the 2010s, it was assumed that by 2030 energy consumption would reach 30% higher than in 2010, with the natural gas market increased to 50% in 2035 (European Strategy and Policy Analysis System, 2015). Green technology has allowed for a cleaner and ‘greener’ energy production which reduces the environmental footprint. Renewables are **widely** exploited and **used**. New forms of energy are also experimented, such as fusion energy, which could bring a **revolution** in the way energy is produced and solve globally the climate change effects (European Strategy and Policy Analysis System, 2015). Given this increased need for natural resources, the recycling industry is gaining attention, as goods and material are being fully recycled so as to save resources and reuse them in future. The recycling of thermostat plastics, a seed trend in 2015 (World Economic Forum, 2015), is under further development to **reduce plastic waste** and support a form of **circular economy**.

• Clearing up the **ecological footprint**. Green technology developments in the BSR managed to eliminate carbon emissions contribute towards mitigating the temperature increase and its possible effects in the region. Furthermore, the eutrophication in the Baltic Sea has considerably been reduced over the last decades, improving and minimising the ecological footprint in the region. In 2050 climate change is overall anticipated and action has been taken so that the region is the first one to adjust to the risks. Risk management is also advanced in the region with the latter being able to deal with natural disasters.

• **Tech Health**. The technological advancements have also **revolutionised healthcare**, through the **nano**- and **biotechnologies**, which results in people being **healthier** for a longer period and living longer. **Genome editing** in humans is also part of health developments. Radical health treatments have been invented where **diseases** formerly uncurable can now be cured. Given, however, the costs of this healthcare this is also targeted to those who ‘have’. Unemployment and inequalities, but also the high pressure at work increase the risks for health problems, such as stress and mental problems or burnouts and depressions. Technology investments have also a more direct impact on people’s everyday lives. Tech implants to people become a reality, for tracking health or fitness trackers, devices serving as the new IDs, companies check-ins, or event mobile phone transplants. Tele-medicine and medical support through drones, especially in remote and sparsely populated areas are part of everyday life, while robots support the elderly at home.

• New virtual values? Dilemmas related to ethical and societal values are emerging due to the mass use of technology in different aspects of people’s lives. Although green technology mediates the environmental concerns and mitigates climate change, still ethical constraints remain in society. These mainly regard the extent of the technological use, the accelerated production, the limited data protection, which pose questions on people’s fundamental rights and freedoms (based on European Strategy and Policy Analysis System, 2015) especially when it comes to e-governance which is today what shapes current politics. New rules on participatory governance mechanisms and creation of trust are necessary (World Economic Forum, 2018). This becomes relevant when social inequalities emerge due to the ‘unlimited growth’, with elite groups participating in and shaping decision making. Cyber-attacks are a **common threat** with not only businesses being hacked but also resulting in harming the global economy (World Economic Forum, 2018). Thus, cybersecurity has been elevated to a **top priority**, with blockchain technologies in support, while the development of ethical guidelines for the global competition seems necessary (based on European Strategy and Policy Analysis System, 2015).

• The neighbourhood relationship: A global ‘coompetition’. In 2050 the BSR is a global key player in green technology to increase its growth and development. Given the high growth prospects, the region is very attractive to FDI, increasing its **global stand** (based on ESPON, 2018). Overall, European and cooperation values are much respected where relevant; nevertheless, there is high global competition, e.g. with other technologically advanced regions in the European Union, as well as other global players in technology, such as China, India or the United States. The relationship with Russia is characterised by limited cooperation, given especially the fact that the BSR is still dependent but to a lesser extent on energy supply from Russia than 30 years ago. Cooperation is mainly structured, along with **cybersecurity** issues and **data protection**.

• To EU and beyond. Despite a grand opening to global investors and markets which has enhanced the profile of the Baltic Sea Region, the European Union remains an important partner. The Baltic Sea Region follows closely the EU policies and in some cases is a frontrunner in implementing them or even an initiator to them, especially when it comes to technology. Policies related to growth and green growth, job creation and innovation are among those of the highest interest. **Cohesion Policy** needs to be **strengthened** in the region, as more **cohesion** and **inclusiveness** is needed, given that social and spatial disparities have increased over the last years.

**Optimal innovation solves existential risks.**

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**EXISTENTIAL RISK** AND A CHANGING HUMANITY

Humanity has already changed a lot over its lifetime as a species. While our biology is not drastically different than it was 70,000 years ago, the capabilities enabled by our **scientific**, **technological**, and **sociocultural achievements** have changed what it is to be human. Whether through the processes of agriculture, the invention of the steam engine, or the practices of storing and passing on knowledge and ideas, and working together effectively as large groups, we have dramatically **augmented** our biological abilities. We can lift heavier things than our biology allows, store and access more information than our brains can hold, and collectively **solve problems** that we could not individually.

The species will change **even more** over coming decades and centuries, as we develop the ability to modify our biology, extend our abilities through various forms of human-machine interaction, and continue the process of sociocultural **innovation**. The long-term future holds tremendous **promise**: continued progress may allow humanity to spread throughout a galaxy that to the best of our knowledge appears devoid of intelligent life. However, what we will be in the future may bear little resemblance to what we are now, both physically and in terms of capability. Our descendants may be augmented far beyond what we currently recognize as human.

This is reflected in the careful wording of Nick Bostrom’s definition of existential risk, the standard definition used in the field. An **existential risk** “is one that threatens the premature **extinction** of earth-originating intelligent life, or the permanent and drastic destruction of its potential for desirable future development.”3 Scholars in the field are less concerned about the form humanity may take in the long-term future, and more concerned that we avoid circumstances that might prevent our descendants---whatever form they may take---from having the opportunity to flourish. One way in which this could happen is if a **cataclysmic event** were to wipe out our species (and perhaps, with it, the capacity for our planet to bear intelligent life in future). But another way would be if a cataclysm fell short of human extinction, but changed our circumstances such that further progress became impossible. For example, **runaway climate change** might not eliminate all of us, but might leave so few of us, scattered at the poles, and so limited in terms of accessible resources, that further scientific, technological, and cultural progress might become impossible. Instead of spreading to the stars, we might remain locked in a **perennial battle** for survival in a much less bountiful world.

The Risks We Have Always **Faced**

For the first 200,000 years of humanity’s history, the risks that have threatened our species as a whole have remained relatively constant. Indonesia’s crater lake Toba is the result of a catastrophic **volcanic super-eruption** that occurred 75,000 years ago, blasting an estimated 2800 cubic kilometers of material into the atmosphere. An erupted mass just 1/100th of this from the Tambora eruption (the largest in recent history) was enough to cause the 1816 “year without a summer,” where interference with crop yields caused mass food shortages across the northern hemisphere. Some lines of evidence suggest that the Toba event may have wiped out a large majority of the human population at the time, although this is debated. At the Chixculub Crater in Mexico, geologists uncovered the scars of the meteor that most likely wiped out seventy-five percent of species on earth at that time, including the dinosaurs, sixty-six million years ago. This may have opened the door, in terms of available niches, for the emergence of mammalian species and ultimately humanity.

Reaching further into the earth’s history uncovers other, even more cataclysmic events for previous species. The Permian-Triassic extinction event wiped out 90–96% of species at the time. Possible causes include **meteor impacts**, **rapid climate change** possibly due to increased methane release, large-scale volcanic activity, or a combination of these. Even further back, the cyanobacteria that introduced oxygen to our atmosphere, and paved the way for oxygen-breathing life, did so at a cost: they brought about the extinction of nearly all life at the time, to whom oxygen was poisonous, and triggered a “snowball earth” ice age.

The threats posed by meteor or **asteroid impacts** and supervolcanoes have not gone away. In principle an asteroid could hit us at any point with little warning. A number of geological hotspots could trigger a volcanic eruption; most famously, the Yellowstone Hotspot is believed to be “due” for another massive explosive eruption.

However, on the timescale of human civilization, these risks are very unlikely in the coming century, or indeed any given century. 660,000 centuries have passed since the event that wiped out the dinosaurs; the chances that the next such event will happen in our lifetimes is likely to be of the order of one in a million. And “due around now” for Yellowstone means that geologists expect such an event at some point in the next 20,000–40,000 years. Furthermore, these threats are static; there is little evidence that their probabilities, characteristics, or modes of impact are changing significantly on a human civilizational timescale.

New Challenges

New challenges have emerged alongside our civilizational progress. As we organized ourselves into larger groups and cities, it became easier for **disease** to spread among us. During the Middle Ages the Black Death outbreaks wiped out 30–60% of Europe’s population. And our travel across the globe allowed us to bring diseases with us to places they would never have otherwise reached; following European colonization of the Americas, disease outbreaks wiped out up to 95% native populations.

The Industrial Revolution allowed huge changes in our capabilities as a species. It allowed **rapid progress** in scientific knowledge, **engineering**, and manufacturing capability. It allowed us to draw heavily from cheap, powerful, and rapidly available **energy sources**---fossil fuels. It helped us to support a much greater global population. The global population more than doubled between 1700 and 1850, and population in England---birthplace of the Industrial Revolution---increased from 5 to 15 million in the same period, and doubled again to 30 million by 1900.4 In effect, these **new technological capabilities** allowed us to extract more resources, create much greater changes to our environment, and support more of us than had ever previously been possible. This is a path we have been **accelerating** along ever since then, with greater globalization, further scientific and technological development, a rising global population, and, in developed nations at least, a rising quality of life and resource use footprint.

On July 16, 1945, the day of the Trinity atomic bomb test, another milestone was reached. Humans had developed a weapon that could plausibly change the global environment in such an extreme way as to threaten the continued existence of the human species.

Yellowstone National Park (Wyoming, USA) is home to one of the planet’s hot spots, where a massive volcanic explosion could someday occur.

Power, Coordination, and Complexity

**Humanity** now has a far **greater power** to shape its environment, locally and globally, than any species that has existed to our knowledge; more so even than the cyanobacteria that turned this into a planet of oxygen-breathing life. We have repurposed huge swathes of the world’s land to our purposes---as fields to produce food for us, cities to house billions of us, roads to ease our transport, mines to provide our material resources, and landfill to house our waste. We have developed structures and tools such as air conditioning and heating that allow us to populate nearly every habitat on earth, the supply networks needed to maintain us across these locations, **scientific breakthroughs** such as antibiotics, and practices such as sanitation and pest control to defend ourselves from the **pathogens** and pests of our environments. We also modify ourselves to be better adapted to our environments, for example through the use of vaccines.

This **increased power** over ourselves and our environment, combined with methods to network and coordinate our activities over large numbers and wide areas, has created **great resilience** against many threats we face. In most of the developed world we can guarantee adequate **food** and **water** access for the large majority of the population, given normal fluctuations in yield; our food sources are varied in type and geographical location, and many countries maintain food stockpiles. Similarly, **electricity grids** provide a stable source of energy for developed populations, given normal fluctuations in supply. We have adequate hygiene systems and access to medical services, given normal fluctuations in disease burden, and so forth. Furthermore, we have sufficient societal stability and resources that we can support many **brilliant people** to work on **solutions** to emerging problems, or to advance our **sciences** and **technologies** to give us ever-greater tools to shape our environments, increase our quality of life, and solve our future problems.

It goes without saying that these privileges exist to a far lesser degree in developing nations, and that many of these privileges depend on often exploitative relationships with developing nations, but this is outside the scope of this chapter. Here the focus is on the resilience or vulnerability of the human-as-species, which is tied more closely to the resilience of the best-off than the vulnerability of the poorest, except to the extent that catastrophes affecting the world’s most vulnerable populations would certainly impact the resilience of less vulnerable populations.

Many of the **tools**, **networks**, and **processes** that make us more resilient and efficient in “normal” circumstances, however, may make us more **vulnerable** in the face of extreme circumstances. While a moderate disruption (for example, a reduced local crop yield) can be absorbed by a network, and compensated for, a catastrophic disruption may overwhelm the entire system, and cascade into linked systems in unpredictable ways. Systems critical for human flourishing, such as food, energy, and water, are inextricably interlinked (the “food-water-energy nexus”) and a disruption in one is near-guaranteed to impact the stability of the others. Further, these affect and are affected by many other human- and human-affected processes: our physical, communications, and electronic infrastructure, political stability (wars tend to both precede and follow famines), financial systems, and extreme weather (increasingly a human-affected phenomenon). These interactions are very dynamic and difficult to predict. Should the water supply from the Himalayas dry up one year, we have very little idea of the full extent of the regional and global impact, although we could reasonably speculate about **droughts**, major **crop failures**, and **mass starvation**, **financial crises**, a massive immigration crisis, **regional warfare** that could go **nuclear** and **escalate internationally**, and so forth. Although unlikely, it is not outside the bounds of imagination that through a series of unfortunate events, a catastrophe might escalate to one that would threaten the **collapse** of **global civilization**.

Two factors stand out.

Firstly, the processes underpinning our planet’s health are interlinked in all sorts of complex ways, and our activities are serving to increase the level of complexity, interlinkage, and unpredictability---particularly in the case of extreme events.

Secondly, the fact is that, despite our various coordinated processes, we as a species are very limited in our ability to act as a globally coordinated entity, capable of taking the most rational actions in the interests of the whole---or in the best interests of our continued survival and flourishing.

This second factor manifests itself in global inequality, which benefits developed nations in some ways, but also introduces major global vulnerabilities; the droughts, famines, floods, and mass displacement of populations likely to result from the impacts of climate change in the developing world are sure to negatively affect even the richest nations. It manifests itself in an inability to act optimally in the face of many of our biggest challenges. More effective coordination on action, communication, and resource distribution would make us more resilient in the face of pandemic outbreaks, as illustrated so vividly by the Ebola outbreak of 2014; a relatively mild outbreak of what should be an easily controllable disease served to highlight how inadequate pandemic preparedness and response was.5, 6 We were lucky that the disease was not one with greater pandemic potential, such as one capable of airborne transmission and with long incubation times.

Our limited ability to coordinate in our long-term interest manifests itself in a difficulty in limiting our global resource use, limiting the impact of our collective activities on our global habitat, and of investing our resources optimally for our long-term survival and well-being. And it limits our ability to guarantee that advances in **science** and **technology** be applied to **further**ing our well-being and resilience, as opposed to being **destabilizing** or even used for **catastrophically hostile purposes**, such as in the case of **nuclear weapons**.

Collective action problems are as old as humanity,7 and we have made significant progress in designing effective institutions, particularly in the aftermath of World War I and II. However, the stakes related to these problems become far greater as our power to influence our environment grows---through sheer force of numbers and distribution across the planet, and through more powerful scientific and technological tools with which to achieve our myriad aims or to frustrate those of our fellows. We are entering an era in which our **greatest risks** are overwhelmingly likely to be caused by our **own activities**, and our own lack of capacity to collectively steer and limit our power.

OUR FOOTPRINT ON THE EARTH

**Population** and **Resource Use**

The United Nations estimated the earth’s population at 7.4 billion as of March 2016, up from 6.1 billion in 2000, 2.5 billion in 1950, and 1.6 billion in 1900. Long-term growth is difficult to predict (being affected by many uncertain variables such as social norms, disease, and the occurrence of catastrophes) and thus varies widely between studies. However, UN projections currently point to a steady increase through the twenty-first century, albeit at a slower growth rate, reaching just shy of 11 billion in 2100.8 Most estimates indicate global population will eventually peak and then fall, although the point at which this will happen is very uncertain. Current estimates of resource use footprints indicate that the global population is using fifty percent more resources per year than the planet can replenish. This is likely to continue rising sharply; more quickly than the overall population. If the average person used as many resources as the average American, some estimates indicate the global population would be using resources at four times the rate that they can be replenished. The vast majority of the population does not use food, energy, and water, nor release CO2 at the rate of the average American. However, the rapid rise of a large middle class in China is beginning to result in much greater resource use and CO2 output in this region, and the same phenomenon is projected to occur a little later on in India.

Catastrophic **Climate Change**

Without a significant change of course on CO2 emissions, the world is on course for significant human-driven global warming; according to the latest IPCC report, an increase of 2.5 to 7.8 °C can be expected under “business as usual” assumptions. The lower end of this scale will have significant negative repercussions for developing nations in particular but is unlikely to constitute a global catastrophe; however, the upper end of the scale would certainly have global catastrophic consequences. The wide range in part reflects significant uncertainty over how robust the climate system will be to the “forcing” effect of our activities. In particular, scientists focused on catastrophic climate change worry about a myriad of possible feedback loops. For example, a reduction of snow cover, which reflects the sun’s heat, could increase the rate of warming resulting in greater loss of snow cover. The loss of arctic permafrost might result in the release of large amounts of methane in the atmosphere, which would accelerate the greenhouse effect further. The extent to which oceans can continue to act as both “heat sinks” and “carbon sinks” as we push the concentration of CO2 in the atmosphere upward is unknown. Scientists theorize the existence of “tipping points,” which, once reached, might trigger an irreversible shift---for example, the collapse of the West Antarctic ice sheets or the melt of Greenland’s huge glaciers, or the collapse of the capacity for oceans to absorb heat and sequester CO2. In effect, beyond a certain point, a “rollercoaster” process may be triggered, where 3 degrees of temperature rise rapidly and irreversibly may lead to 4 degrees, and then 5.

Laudable progress has been made on achieving global coordination around the goal of reducing global carbon emissions, most notably in the aftermath of the December 2015 United Nations Climate Change Conference. 174 countries signed an agreement to reach zero net anthropogenic greenhouse gas emissions by the second half of the twenty-first century, and to “pursue efforts to limit” the temperature increase to 1.5 °C. But many experts hold that these goals are unrealistic, and that the commitments and actions being taken fall far short of what will be needed. According to the International Energy Agency’s Executive Director Fatih Birol: “We think we are lagging behind strongly in key technologies, and in the absence of a strong government push, those technologies will never be deployed into energy markets, and the chances of reaching the two-degree goal are very slim.”9

**Soil Erosion**

Soil erosion is a natural process. However human activity has increased the global rate dramatically, with deforestation, drought, and climate change accelerating the rate of loss of fertile soil. There are reasons to expect this trend to accelerate; some of the most powerful drivers of soil erosion are extreme weather events, and these events are expected to increase dramatically in frequency and severity as a result of climate change.

**Biodiversity Loss**

The world is entering an era of dramatic species extinction driven by human activity.10 Since 1900, vertebrate species have been disappearing at more than 100 times the rate seen in non-extinction periods. In addition to the intrinsic value of the diversity of forms of life on earth (the only life-inhabited planet currently known to exist in the universe), catastrophic risk scholars worry about the consequences for human societies. Ecosystem resilience is a tremendously complex phenomenon, and it seems plausible that tipping points exist in them. For example, the collapse of one or more keystone species underpinning the stability of an ecosystem could result in a broader ecosystem collapse with potentially devastating consequences for human system stability (for example, should key pollinator species disappear, the consequences for agriculture could be profound). Current human flourishing relies heavily on these ecosystem services, but we are threatening them at an unprecedented rate, and we have a poor ability to predict the consequences of our activity.

Everything Affects Everything Else

Once again, the sheer complexity and interconnectedness of these risks represents a key challenge. None of these processes happen in isolation, and developments in one affect the others. Climate change affects ecosystems by forcing species migration (for those that can), a change in plant and animal patterns of growth and behavior, and by driving species extinction. Reductions in available soil force us to drive more deeply into nonagricultural wilderness to provide the arable land we need to feed our populations. And the ecosystems we threaten play important roles in maintaining a stable climate and environment. Recognizing that we cannot get all the answers we need on these issues by studying them in isolation, threats posed by the interplay of these phenomena are a key area of study for catastrophic risk scholars.

All these developments result in a world with greater uncertainty, the emergence of huge and unpredictable new vulnerabilities, and more extreme and unprecedented events. These events will play out in a crowded world that contains more **powerful technologies**, and more powerful weapons, than have ever existed before.

HUMANITY AND TECHNOLOGY IN THE TWENTY-FIRST CENTURY

Our progress in **science** and **technology**, and related **civilizational advances**, have allowed us to house far more people on this planet, and have provided the power for those people to influence their environment more than any previous species. This progress is not of itself a bad thing, nor is the size of our global population.

There are good reasons to think that with careful planning, this planet should be able to house seven billion or more people stably and comfortably.11 With **sustainable agricultural** practices and **innovative use** of **irrigation** methods, it should be **possible** for many relatively uninhabited and agriculturally **unproductive** parts of the world to support more **people** and **food production**. An endless population growth on a finite planet is not possible without a collapse; however, growth until the point of collapse is by no means inevitable. Stabilization of population size is strongly correlated with several factors we are making steady global progress on: including education (especially of women), and rights and a greater level of control for women over their own lives. While there are conflicting studies,12 many experts hold that decreasing child mortality, while leading to population increase in the near-term, leads to a drop in population growth in the longer term. In other words, as we move toward a better world, we will bring about a more stable world, provided intermediate stages in this process do not trigger a collapse or lasting global harm.13, 14

Current advances in **science** and **technology**, while not sufficient in themselves, will play a key role in making a more resilient and **sustainable future** possible. Rapid progress is happening in **carbon-zero energy** sources such as solar photovoltaics and other renewables.15 Energy storage remains a problem, but progress is occurring on **battery efficiency**. Advances in irrigation techniques and desalination **technologies** may allow us to provide water to areas where this has not previously been possible, allowing both food production and other processes that depend on reliable access to clean water. Advances in **materials technology** will have wide-ranging benefits, from lighter, more energy-efficient vehicles, to more efficient buildings and **energy grids**, to more **powerful scientific tools** and **novel technological innovations**. Advances in our understanding of the genetics of plants are leading to crops with **greater yields**, greater resilience to **temperature shifts**, droughts and other extreme weather, and greater resistance to pests---resulting in a reduction of the need for polluting pesticides. We are likely to see many further **innovations** in food production; for example, exciting advances in lab-grown meat may result in the production of meat with a fraction of the **environmental footprint** of livestock farming.

Many of the processes that have resulted in our current unsustainable trajectories can be traced back to the Industrial Revolution, and our widespread adoption of fossil fuels. However, the Industrial Revolution and fossil fuels must also be recognized as having unlocked a level of prosperity, and a rate and scale of scientific and technological progress that would simply not have been possible without them. While a continued reliance on fossil fuels would be catastrophic for our environment, it is unclear whether many of the “clean technology” breakthroughs that will allow us to break our dependence on fossil fuels would have been possible without the scientific breakthroughs that were enabled directly, or indirectly, by this rich, abundant, and easily available fuel source. The goal is clear: having benefitted so tremendously from this “dirty” stage of technology, we now need to take advantage of the opportunity it gives us to move onto cleaner and more powerful next-generation energy and manufacturing technologies. The challenge will be to do so before thresholds of irreversible global consequence have been passed.

With 537 square meters of solar panels and six blocks of lithium-ion batteries, PlanetSolar is the world’s largest solar ship, as well as its fastest. It is also the first to have sailed round the world using exclusively solar power.

The broader challenge is that humanity as a species needs to transition to a stage of technological development and global cooperation where as a species we are “living within our means”: producing and using energy, water, food, and other resources at a sustainable rate, and by methods that will not impose long-term negative consequences on our global habitat---for at least as long as we are bound to it. There are no physical reasons to think that we might not be capable of developing an extensive space-faring civilization at a future point. And if we last that long, it is likely we will develop extensive abilities to terraform extraterrestrial environments to be hospitable to us---or indeed, transform ourselves to be suitable to currently inhospitable environments. However, at present, in Martin Rees’s words, there is no place in our Solar System nearly as hospitable as the most hostile environment on earth, and so we are bound to this fragile blue planet.

Part of this broader challenge is gaining a better understanding of the complex consequences of our actions, and more so, of the limits of our current understanding. Even if we cannot know everything, recognizing when our uncertainty may lead us into dangerous territory can help us figure out an appropriately cautious set of “safe operating parameters” (to borrow a phrase from Steffen et al.’s “Planetary Boundaries”16) for our activities. The second part of the challenge, perhaps harder still, is developing the level of global coordination and cooperation needed to stay within these safe operating parameters.

Technological Wild Cards

While much of the Centre for the Study of Existential Risk’s research focuses on these challenges---climate change, ecological risks, resource use, and population, and the interaction between these---the other half of our work is on another class of factors: transformative **emerging** and future **technologies**. We might consider these “wild cards”; technological developments significant enough to change the course of **human civilization** significantly in and of themselves. **Nuclear weapons** are such a wild card; their development changed the nature of geopolitics instantly and irreversibly. They also changed the nature of global risk: now many of the stressors we worry about **might escalate** quite quickly through human activity to a worst-case scenario involving a **large-scale exchange** of **nuclear missiles**. The scenario of most concern from an **existential risk standpoint** is one that might trigger a **nuclear winter**: a level of destruction sufficient to send huge amounts of particulate matter into the atmosphere and cause a lengthy period of **global darkness** and **cold**. If such a period persisted for long enough, this would collapse global **food production** and could drive the human species to near- or **full-extinction**. There is disagreement among experts about the scale of nuclear exchange needed to trigger a nuclear winter, but it appears eminently plausible that the world’s remaining arsenals, if launched, might be sufficient.

Nuclear weapons could be considered a wild card in a different sense: the underlying science is one that enabled the development of nuclear power, a viable carbon-zero alternative to fossil fuels. This dual-use characteristic---that the underlying science and technology could be applied to both destructive purposes, and peaceful ones---is common to many of the emerging technologies that we are most interested in.

A few key sciences and technologies of focus for scholars in this field include, among others:

Topics within bioscience and bioengineering such as the manipulation and modification of certain viruses and bacteria, and the creation of organisms with novel characteristics and capabilities (genetic engineering and synthetic biology).

**Geoengineering**: a suite of proposed large-scale technological interventions that would aim to “engineer” our climate in an effort to slow or even reverse the most severe impacts of climate change.

Advances in **a**rtificial **i**ntelligence---in particular, those that relate to progress toward artificial general intelligence---AI systems capable of matching or surpassing human intellectual abilities across a broad range of domains and challenges.

Progress on these sciences are driven in great part by a recognition of their potential for improving our quality of life, or the role they could play in aiding us to combat existing or emerging global challenges. However, in and of themselves they may also pose **large risks**.

Virus Research

Despite advances in hygiene, vaccines, and other health technology, natural **pandemic outbreaks** remain among the most potent **global threats** we face; for example, the 1918 Spanish influenza outbreak killed more people than World War I. This threat is of particular concern in our increasingly crowded, **interconnected world**. Advances in **virology research** are likely to play a central role in better defenses against, and responses to, viruses with **pandemic potential.**

A particularly controversial area of research is “gain-of-function” virology research, which aims to modify existing viruses to give them different host transmissibility and other characteristics. Researchers engaged in such research may help identify strains with high pandemic potential, and develop vaccines and antiviral treatment. However, research with infectious agents runs the risk of accidental release from research facilities. There have been suspected releases of infectious agents from laboratory facilities. The 1977–78 Russian influenza outbreak is strongly suspected to have originated due to a laboratory release event,17 and in the UK, the 2007 foot-and-mouth outbreak may have originated in the Pirbright animal disease research facility.18 Research on live infectious agents is typically done in facilities with the highest biosafety containment procedures, but some experts maintain that the potential for release, while low, remains, and may outweigh the benefits in some cases.

Some worry that advances in some of the same underlying sciences may make the development of novel, targeted **biological weapons** more feasible. In 2001 a research group in Australia inadvertently engineered a variant of mousepox with high lethality to vaccinated mice.19 An accidental or deliberate release of a similarly modified virus infecting humans, or a species we depend heavily on, could have **catastrophic consequences**.

Similarly, **synthetic biology** may lead to a wide range of tremendous **scientific benefits**. The field aims to design and construct new biological parts, devices, and systems, and to comprehensively redesign living organisms to perform functions useful to us. This may result in synthetic bacterial and plant “microfactories,” designed to produce new medicines, materials, and fuels, to break down waste, to act as sensors, and much more. In principle, such biofactories could be designed with much greater precision than current genetic modification and biolytic approaches. They should also allow products to be produced cheaply and cleanly. Such advances would be transformative on many **challenges** we currently face, such as global health care, energy, and fabrication.

Moreover, as the tools and facilities needed to engage in the science of synthetic biology become cheaper, a growing “citizen science” community is emerging around synthetic biology. Community “DIY Bio” facilities allow people to engage in novel experiments and art projects; some hobbyists even engage in synthetic biology projects in their own homes. Many of the leaders in the field are committed to synthetic biology being as open and accessible as possible worldwide, with scientific tools and expertise available freely. Competitions such as iGEM (International Genetically Engineered Machine) encourage undergraduate student teams to build and test biological systems in living cells, often with a focus on applying the science to important real-world challenges, and also to archive their results and products so as to make them available to future teams to build on.

Such citizen science represents a wonderful way of making cutting-edge science accessible and exciting to generations of innovators. However, the increasing ease of access to increasingly powerful tools is a cause of concern to the risk community. Even if the vast majority engaging in synthetic biology are both responsible and well intentioned, the possibility of **bad actors** or unintended consequences (such as the release of an organism with unintended ecological consequences) exists. Further, we may expect that the range and severity of negative consequences will increase, as well as the difficulty in tracking those who have access to the necessary tools and expertise. At present, biosafety and biosecurity is deeply embedded within the major synthetic biology initiatives. In the United States, the FBI works closely with synthetic biology centers, and leaders in the field espouse the need for good practices at every level. However, this area will progress rapidly, and a balance will **need to be struck** between allowing access to powerful tools to a wide number of people who can do good with them, while restricting the potential for accidents or deliberate **misuse**. It remains to be seen how easy it will be to achieve this.

Geoengineering represents a host of challenges. Stratospheric aerosol geoengineering represents a particularly powerful proposal: here, a steady stream of reflective aerosols would be released into the upper atmosphere in order to reduce the amount of the sun’s light reaching the earth’s surface globally. This effectively mimics the global cooling phenomenon that occurs after a large volcanic eruption, when particulate matter is blasted into the atmosphere. However, current work is focused on theoretical modelling, with very minimal practical field tests carried out to date. Questions remain about how practically feasible it would be to achieve this on a global scale, and what impact it would have on rainfall patterns and crop growth.

It should be highlighted that this is not a solution to climate change. While global temperature might be stabilized or lowered, unless this was accompanied by reduction of CO2 emissions, then a host of damages such as ocean acidification would still occur. Furthermore, if CO2 emissions were allowed to continue to rise during this period, then a major risk termed “termination shock” could manifest. In this case, if any circumstance resulted in an abrupt cessation of stratospheric aerosol geoengineering, then the increased CO2 concentration in the atmosphere would result in a rapid jump in global temperature, which would have far more severe impacts on ecosystems and human societies than the already disastrous effects of a gradual rise.

Critics fear that such research might be misunderstood as a way of avoiding the far more costly process of eliminating carbon emissions; and some are concerned that intervening in such a profound way in our planet’s functioning is deeply irresponsible. It also raises knotty questions about global governance: should any one country have the right to engage in geoengineering, and, if not, how could a globally coordinated decision be reached, particularly if different nations have different exposures to the impacts of climate change, and different levels of concern about geoengineering, given we are all under the same sky?

Proponents highlight that we may already be committed to severe global impacts from climate change at this stage, and that such techniques may allow us the necessary breathing room needed to transition to zero-carbon technology while temporarily mitigating the worst of the harms. Furthermore, unless research is carried out to assess the feasibility and likely impacts of this approach, we will not be well placed to make an informed decision at a future date, when the impacts of climate change may necessitate extreme measures. Eli Kintisch, a writer at Science, has famously called geoengineering “a bad idea whose time has come.”20

**Artificial intelligence**, explored in detail in Stuart Russell’s chapter, may represent the wildest card of all. Everything we have achieved in terms of our civilizational progress, and shaping the world around us to our purposes, has been a product of our intelligence. However, some of the intellectual challenges we face in the twenty-first century are ones that human intelligence alone is not best suited to: for example, sifting through and identifying patterns in huge amounts of data, and integrating information from vast and interlinked systems. From analyzing disparate sources of climate data, to millions of human genomes, to running thousands of simulations, artificial intelligence will aid our ability to make use of the huge amount of knowledge we can gather and generate, and will help us make sense of our increasingly complex, interconnected world. Already, AI is being used to optimize energy use across **Google’s servers**, replicate intricate **physics experiments**, and discover new **mathematical proofs**. Many specific tasks traditionally requiring human intelligence, from language translation to driving on busy roads, are now becoming automatable; allowing greater efficiency and productivity, and freeing up human intelligence for the tasks that AI still cannot do. However, many of the same advances have more **worrying applications**; for example, allowing collection and deep analysis of data on us as individuals, and paving the road for the development of cheap, **powerful**, and easily scalable **autonomous weapons** for the battlefield.

These advances are already having a dramatic impact on our world. However, the vast majority of these systems can be described as “narrow” AI. They can perform functions at human level or above in narrow, well-specified domains, but lack the general cognitive abilities that humans, dogs, or even rats have: general problem-solving ability in a “real-world” setting, an ability to learn from experience and apply knowledge to new situations, and so forth.

There is renewed enthusiasm for the challenge of achieving “general” AI, or AGI, which would be able to perform at human level or above across the range of environments and cognitive challenges that humans can. However, it is currently unknown how far we are from such a scientific breakthrough, or how difficult the fundamental challenges to achieving this will be, and expert opinion varies widely. Our only proof of principle is the human brain, and it will take decades of progress before we can meaningfully understand the brain to a degree that would allow us to replicate its key functions. However, if and when such a breakthrough is achieved, there is reason to think that progress from human-level general intelligence to superintelligent AGI might be achieved quite rapidly.

Improvements in the hardware and software components of AI, and related sciences and technologies, might be made rapidly with the aid of advanced general AI. It is even conceivable that AI systems might directly engage in high-level AI research, in effect accelerating the process by allowing cycles of self-improvement. A growing number of experts in AI are concerned that such a process might quickly result in extremely powerful systems beyond human control; Stuart Russell has drawn a comparison with nuclear chain reaction.

**Superintelligent AI** has the potential to unlock **unprecedented progress** on science, technology, and global challenges; to paraphrase the founders of Google DeepMind, if intelligence can be “solved,” it can then be used to help solve everything else. However, the risk from this hypothetical technology, whether through deliberate use or unintended runaway consequences, **could be greate**r than that of any technology in human history. If it is plausible that this technology might be achieved in this century, then a great deal of **research** and **planning**---both on the technical design of such systems, and the governance structures around their development---will be **needed** in the decades beforehand in order to achieve a desirable transition.

Predicting the Future

The field also engages in exploratory and foresight-based work on more forward-looking topics; these include future advances in neuroscience and nanotechnology, future physics experiments, and proposed manufacturing technologies that may be developed in coming decades, such as molecular manufacturing. While we are limited in what we can say in detail about future scientific breakthroughs, it is often possible to establish some useful groundwork. For example, we can identify developments that should, in principle, be possible based on our current understanding of the relevant science. And we can dismiss ideas that are pure “science fiction,” or sufficiently unfeasible to be safely ignored for now, or that represent a level of progress that makes them unlikely to be achieved for many generations.

By focusing further on those that could plausibly be developed within the next half century, we can give considerations to their underlying characteristics and possible impacts on the world, and of the broad principles we might bear in mind for their safe development and application. While it would have been a fool’s errand to try to predict the full impacts of the Internet prior to 1960, or of the development of nuclear weapons prior to 1945, it would certainly be possible to develop some thinking around the possible implications of very sophisticated global communications and information-sharing networks, or of a weapon of tremendous destructive potential.

Lastly, if we have some ideas about the directions from which transformative developments might come, we can engage in foresight and road-mapping research. This can help identify otherwise insignificant breakthroughs and developments that may indicate meaningful progress toward a more transformative technology being reached, or a threshold beyond which global dynamics are likely to shift significantly (such as photovoltaics and energy storage becoming cheaper and more easily accessible than fossil fuels).

Confronting the Limits of Our Knowledge

A common theme across these emerging technologies and emerging risks is that a tremendous level of scientific uncertainty and expert disagreement typically exists. This is particularly the case for future scientific progress and capabilities, the ways in which advances in one domain may influence progress in others, and the likely global impacts and risks of projected advances. Active topics of research at CSER include how to obtain useful information from a range of experts with differing views, and how to make meaningful scientific progress on challenges where we have discontinuous data, or few case studies to draw on, or even when we must characterize an entirely unprecedented event. This might be a hypothesized ecological tipping point, which when passed would result in an irreversible march toward the collapse of an entire critical ecosystem. Or it might be a transformative scientific breakthrough such as the development of artificial general intelligence, where we only have current trends in AI capability, hardware, and expert views on the key unsolved problems in the field to draw insight from. It is unrealistic to expect that we can always, or even for the most part, be right. We need to have humility, to expect false positives, and to be able to identify priority research targets from among many weak signals.

Recognizing that there are limits to the level of detail and certainty that can be achieved, this work is often combined with work on general principles of scientific and technological governance. For example, work under the heading of “**responsible innovation**” focuses on the challenge of developing collective stewardship of progress in **science** and **technology** in the present, with a view to achieving **good future outcomes**.21 This combines scientific foresight with processes to involve the key stakeholders at the appropriate stages of a technology’s development. At different stages these stakeholders will include: scientists involved in fundamental research and applied research; industry leaders; researchers working on the risks, benefits, and other impacts of a technology; funders; policymakers; regulators; NGOs and focus groups; and laypeople who will use or be affected by the development of a technology. In the case of technologies with a potential role in global catastrophic risk, the entire global population holds a stake. Therefore decisions with long-term consequences must not rest solely with a small group of people, represent only the values of a small subset of people, or fail to account for the likely impacts on the global population.

There have been a number of very encouraging specific examples of such foresight and collaboration, where scientific domain specialists, interdisciplinary experts, funders, and others have worked together to try to guide an emerging technology’s development, establish ethical norms and safety practices, and explore its potential uses and misuses in a scientifically rigorous way. In bioengineering, the famous 1975 Asilomar conference on recombinant DNA established important precedents, and more recently summits have been held on advances such as human gene editing. In artificial intelligence, a number of important conferences have been held recently, with enthusiastic participation from academic and industry research leaders in AI alongside interdisciplinary experts and policymakers. A number of the world’s leading AI research teams have established ethical advisory panels to inform and guide their scientific practices, and a cross-industry “partnership on AI to benefit people and society” involving five companies leading fundamental research has recently been announced.22

More broadly, it is crucial that we learn from the lessons of past technologies and, where possible, develop principles and methodologies that we can take forward. This may give us an advantage in preparing for developments that are currently beyond our horizon and that methodologies too deeply tied to specific technologies and risks may not allow. One of the key concerns associated with risks from emerging and future technologies is the rate at which progress occurs and at which the associated threats may arise. While every science will throw up specific challenges and require domain-specific techniques and expertise, any tools or methodologies that help us to intervene reliably earlier are to be welcomed. There may be a limited window of opportunity for averting such risks. Indeed, this window may occur in the early stages of developing a technology, well before the fully mature technology is out in the world, where it is difficult to control. Once Pandora’s box is open, it is very difficult to close.

WORKING ON THE (DOOMSDAY) CLOCK

**Technological progress** now offers us a vision of a **remarkable future**. The advances that have brought us onto an unsustainable pathway have also raised the quality of life dramatically for many, and have unlocked scientific directions that can lead us to a safer, cleaner, more **sustainable world**. With the right developments and applications of technology, in concert with advances in social, democratic, and distributional processes globally, **progress can be made** on all of the challenges discussed here. Advances in renewable energy and related technologies, and more efficient energy use---advances that are likely to be accelerated by progress in technologies such as artificial intelligence---can bring us to a point of zero-carbon emissions. New manufacturing capabilities provided by synthetic biology may provide cleaner ways of producing products and degrading waste. A greater scientific understanding of our natural world and the ecosystem services on which we rely will aid us in plotting a trajectory whereby critical environmental systems are maintained while allowing human flourishing. Even advances in education and women’s rights globally, which will play a role in achieving a stable global population, can be aided specifically by the information, coordination, and education tools that technology provides, and more generally by growing prosperity in the relevant parts of the world.

There are catastrophic and **existential risks** that we will simply not be able to overcome without advances in **science** and **technology**. These include possible **pandemic** outbreak**s**, whether natural or engineered. The early identification of incoming **asteroids**, and approaches to shift their path, is a topic of active research at NASA and elsewhere. While currently there are no known techniques to prevent or mitigate a **supervolcanic eruption**, this may not be the case with the tools at our disposal a century from now. And in the longer run, a civilization that has spread permanently beyond the earth, enabled by advances in **spaceflight**, **manufacturing**, **robotics**, and **terraforming**, is one that is much more likely to endure. However, the breathtaking power of the tools we are developing is not to be taken lightly. We have been very lucky to muddle through the advent of nuclear weapons without a global catastrophe. And within this century, it is realistic to expect that we will be able to rewrite much of biology to our purposes, intervene deliberately and in a large-scale way in the workings of our global climate, and even develop agents with intelligence that is fundamentally alien to ours, and may vastly surpass our own in some or even most domains---a development that would have uniquely unpredictable consequences.

It is reassuring to note that there are relatively few individual events that could cause an existential catastrophe---one resulting in extinction or a permanent civilizational collapse. Setting aside the very rare events (such as supervolcanoes and asteroids), the most plausible candidates include **nuclear winter**, extreme **global warming** or cooling scenarios, the accidental or deliberate release of an organism that **radically altered** the planet’s functioning, or the release of an **engineered pathogen**. They also include more speculative future advances: new types of **weaponry**, **runaway** **a**rtificial **i**ntelligence, or maybe physics experiments beyond what we can currently envisage. Many global risks are, in isolation, survivable---at least for some of us---and it is likely that human civilization could recover from them in the long run: less severe global warming, various environmental disasters and ecosystem collapses, widespread starvation, most pandemic outbreaks, conventional warfare (even global).

However, this latter class of risks, and factors that might drive them (such as population, resource use, and climate change) should not be ignored in the broader study of existential risk. Nor does it make sense to consider these challenges in isolation: in our interconnected world they all affect each other. The threat of **global nuclear war** has not gone away, and many scholars believe that it may be rising again (at the time of writing, North Korea has just undergone its most ambitious nuclear test to date). If climate pressures, drought, famine, and other resource pressures serve to escalate geopolitical tensions, or if the potential use of a **new technology**, such as geoengineering, could lead to a **nuclear standoff**, then the result is an **existential threat**.

For all these reasons and more, a growing community of scholars across the world believe that the twenty-first century will see greater change and greater challenges than any century in humanity’s past history. It will be a century of unprecedented global pressures, and a century in which extreme and unpredictable events are likely to happen more frequently than ever before in the past. It will also be a century in which the power of **technologies** unlike any we have had in our past history will hang over us like multiple **Damocles’ swords**. But it will also be a century in which the technologies we **develop**, and the institutional structures we develop, may aid us in solving many of the **problems** we currently face---if we **guide** their **development**, and their uses and applications, carefully.

**Sustainable development solves extinction, but failure causes cascading risks that cumulatively outweigh any single risk.**

**Fenner** and Cernev **20**, [Richard Fenner (BSc (Hons) PhD CEng MICE FCIWEM) is Director of the MPhil in Engineering for Sustainable Development at Cambridge, Cernev – Australian National University, Canberra, Australia, The importance of achieving foundational Sustainable Development Goals in reducing global risk, Volume 115, January 2020, https://www.sciencedirect.com/science/article/pii/S0016328719303544]

Fig. 3 demonstrates that cascade failures can be transmitted through the complex inter-relationships that link the Sustainable Development Goals. Randers, Rockstrom, Stoknes, Goluke, Collste, Cornell, Donges et al. (2018) have suggested that where meeting some SDGs impact negatively on others, this may lead to “crisis and conflict accelerators” and “threat multipliers” resulting in conflicts, instability and migrations. Ecosystem stresses are likely to disproportionately affect the security and social cohesion of **fragile** and poor **communities**, amplifying latent tensions which lead to political instabilities that **spread far beyond** their regions. The resulting “bad fate of the poor will end up **affecting** the **whole global system**"(Mastrojeni, 2018). Such possibilities are likely to go beyond incremental damage and lead to **runaway collapse**.

The **W**orld **E**conomic **F**orums’ Global Risks Report for 2018 shows the **top** five **global risks** in terms of **likelihood** and **impact** have changed from being economic and social in 2008 to environmental and technological in 2018, and are **closely aligned** with many SDGs (World Economic Forum, 2018). The report notes “that we are much less competent when it comes to dealing with complex risks in systems characterised by feedback loops, tipping points and opaque cause-and-effect relationships that can make intervention problematic”. The most likely risks expected to have the greatest impact currently include extreme weather events natural disasters, cyber attacks, data fraud or theft, failure of climate change mitigation and water crises.

These are represented in Fig. 3 by the following exogenous variables. “Climate change” drives the need for Climate Action (SDG 13), “Cyber threat” may adversely impact technology implementation and advancement which will disrupt Sustainable Cities and Communities (SDG 11); Decent Work and Economic Growth (SDG 8) and the rate of introduction of Affordable and Clean Energy (SDG 7), with reductions in these goals having direct consequences in also reducing progress in the other goals which they are closely linked to. “Data Fraud or Threat” has the capacity to inhibit innovation and Industrial Performance (SDG 9), reducing competitiveness (and having the potential to erode societal confidence in governance processes). “Water Crises” (linked with climate change) have a direct impact on Human Health and Well Being (SDG 3) as well as reducing access to Clean Water and Sanitation (SDG 6) and reducing agricultural production which increases Hunger (SDG 2). The causal loop diagram also highlights “Conflict” as a variable (driven by multiple environmental-socio-economic factors) which together with regions most impacted by climate degradation will lead to an increase in migrant refugees enhancing the spread of disease and global pandemic risk, thus impacting directly on Human Health and Well Being (SDG 3)

4.2. Existential and catastrophic risk

The level and consequences of these risks may be severe. Existential Risks (ER) have a wide scope, with extreme danger, and are “a risk that threatens the premature extinction of humanity or the permanent and drastic destruction of its potential for desirable future development” (Farquhar et al., 2017,) essentially being an event or scenario that is “transgenerational in scope and terminal in intensity” (Baum & Handoh, 2014). With a smaller scope, and lower level of severity, global catastrophic risk is defined as a scenario or event that results in at least 10 million fatalities, or $10 trillion in damages (Bostrom & Ćirković, 2008). Global Catastrophic Risk (GCR) events are those which are global, but they are durable in that humanity is able to recover from them (Bostrom & Ćirković, 2008; Cotton-Barratt, Farquhar, Halstead, Schubert, & Snyder-Beattie, 2016) but which still have a long-term impact (Turchin & Denkenberger, 2018b).

Achieving the **S**ustainable **D**evelopment **G**oal**s** can be considered to be a means of **reduc**ing the long-term global **catastrophic** and **existential risks** for humanity. **Conversely** if the targets represented across the SDGs remain **unachieved** there is the potential for these forms of **risk** to **develop**. This association **combined** with the **likely emergence** of **new challenges** over the next decades (Cook, Inayatullah, Burgman, Sutherland, & Wintle, 2014) means that it is of great value to identify points within the systems representations of the Sustainable Development Goals that could both lead to global catastrophic risk and existential risk, and conversely that could act as **prevention**, or **leverage points** in order to avoid such outcomes. This identification in turn enables sensible policy responses to be constructed (Sutherland & Woodroof, 2009).

Whilst **existential threats** are **unlikely**, there is **extensive peril** in **global catastrophic risks**. Despite being lesser in severity than existential risks, they **increase** the **likelihood of** human **extinction** (Turchin & Denkenberger, 2018a) through **chain reactions** (Turchin & Denkenberger, 2018a), and **inhibiting** humanity’s **response to other risks** (Farquhar et al., 2017). It is **necessary** to **consider** **risks** that **may seem small,** as **when acting together**, they can have **extensive consequences** (Tonn, 2009). Furthermore, the high adaptability potential of humans, and society, means that for humanity to become extinct, it is **most likely** that there would be a **series of events** that **culminate** in **extinction** **as opposed to one** large scale **event** (Tonn & MacGregor, 2009; Tonn, 2009).

Whilst the prospect of existential risk, or global catastrophic risk can seem distant, the Stern Review on the Economics of Climate Change estimated the risk of extinction for humanity as 0.1 % annually, which accumulates to provide the risk of extinction over the next century as 9.5 % (Cotton-Barratt et al., 2016). With respect to identifying these risks, it is known that in particular, “**positive feedback loops**… represent the **gravest** existential **risks**” (Kareiva & Carranza, 2018), with pollution also having the potential to pose an existential risk.

**Industrial ag collapses insect populations---extinction.**

Dr. Liz **Kimbrough 21**, Ph.D. in Ecology and Evolutionary Biology from Tulane University, BS in Botany from Humboldt State University, Journalist at Monga Bay, “Are Major Insect Losses Imperiling Life on Earth?”, Monga Bay, 1/28/2021, https://india.mongabay.com/2021/01/are-major-insect-losses-imperiling-life-on-earth/

* New studies assessing insect declines around the planet find that on average, the decline in insect abundance, seen on nearly every continent, is thought to be around 1-2% per year or 10-20% per decade.
* **Precipitous** insect declines are being **escalate**d by humanity as soaring population and advanced **tech**nology push us closer to **overshooting** several **critical planetary boundaries** including biodiversity, climate change, nitrification, and pollution.
* Action on a large scale (international, national, and public/private policymaking), and on a small scale (replacing lawns with insect-friendly habitat, for example) are **desperately needed** to **curb** and **reverse** insect decline.

Chances are, the works of the world’s insects touch your lips every day. The coffee or tea you savor, both are pollinated by insects. Apples, oranges, cabbages, cashews, cherries, carrots, broccoli, watermelon, garlic, cinnamon, basil, sunflower seeds, almonds, canola oil---all are insect-pollinated. Honey, dyes, even some vaccines require insects to come to fruition.

Vital to the world’s **food web**, nested in **nutrient cycling**, and embedded in **industries**---the closer we look, the more we see insects as **vital** to maintaining **life’s frameworks**. Referring to this fact, famed biologist E.O. Wilson wrote in 1987, **“[I]f invertebrates were to disappear, I doubt the human species could last more than a few months.”**

Which is why the precipitous decline of insects is **raising alarms**.

Insect populations are being reduced at varying rates across space and time, but on average, the decline in their abundance is thought to be around 1-2% per year, or 10-20% per decade.

“Think of a landowner with a million-dollar house on a river that’s a little bit wild. And they’re losing 10% to 20% of their land every decade, and it’s **horrifying**. It means that after **even a century**, you really don’t have **anything left**,” David Wagner, an entomologist with the University of Connecticut told Mongabay in an interview. That, he says of this comparison, is the danger we now face.

Wagner has just edited a newly released in-depth feature in the Proceedings of the National Academy of Science, Global Decline of Insects in the Anthropocene, in which 56 researchers present scientific studies, opinions and news on insect declines. The journal offers perspectives on the ecological, taxonomic, geographical and sociological dimensions of insect declines, along with suggestions on how we move forward to study and reverse this drain on global biodiversity.

Insect “death by a thousand cuts”

In a perspective piece that leads off the special issue, Wagner and his co-authors address the likely causes of insect decline. The main stressors to insects, they write, are changes in land use (particularly deforestation), agriculture, climate change, nitrification, pollution and introduced species. However, the importance of each stressor and how they interact still puzzles scientists.

“There are so many good scientists that can’t figure out what the cause is,” Wagner said. He poses the well-known honeybee as an example. “I mean, this thing is worth billions upon billions of dollars and we don’t know why it’s having such a hard time. And I think the reason is, it’s death by a thousand cuts… most of these things are hit by four or five pretty important stressors, and they’re acting synergistically.”

The articles that follow that opening essay zero in on the key causes for some of the biggest known losses:

A study by Wagner and Peter Raven, president emeritus of the Missouri Botanical Garden, concludes that declines in insect biodiversity and biomass are linked to the **intensification of agriculture** over the past 50 years.

Research by Dan Janzen and Winnie Hallwachs---both biologists from the University of Pennsylvania who describe themselves as “intense observers of caterpillars, their parasites, and their associates”---focuses on climate change as a stressor. Since the late 1970s, they write, they’ve watched as insect declines came to the dry forests, cloud forests, and rainforests of Costa Rica’s Guanacaste Conservation Area, as the region was plagued by rising temperatures, increasingly erratic seasons and inconsistent rainfall.

Another study in the special feature, titled, Insects and recent climate change, argues that climate may be playing even more of a role in declines than land-use change---which is massive around the planet mostly due to agribusiness expansion. The authors base their climate findings on a Northern California butterflies case study, where declines were severe even in areas suffering little habitat loss. Similar losses within well-protected areas have been detected in Germany and Puerto Rico.

Likewise, butterfly populations in Europe face challenges. In the UK, butterfly numbers have declined by around 50% over the past 50 years, with 8% of known resident species considered extinct. In the Netherlands, upwards of 20% of species have been lost and in Belgium 29%. Researchers suggest habitat loss, habitat degradation and chemical pollution as the primary causes. The authors offer conservation solutions and recommend policy changes to conserve butterflies and other insects---but so far political will has been lacking.

Moving from the winged creatures of the day to night fliers, Wagner and colleagues give an overview of the global state of moth declines. Moths are extremely diverse and cosmopolitan. “For every butterfly that Mongabay readers see during the daytime, there are 19 species of moths flying around at night,” Wagner revealed.

Although moth numbers have declined in some areas, such as in parts of Europe and Central America, in other, mostly temperate areas, many moth taxa are increasing in abundance. Another study found that the overall abundance of arthropods in the Arctic has increased in recent years. Researchers attribute these increases in insect abundance to climate change, which scientists say has both its species winners and losers. As warmer temperatures march northward, new suitable habitats open up for insects. The consequences of this range expansion---and the conflicts which may occur with plant and insect species already occupying those ranges---have yet to be analysed.

Insect declines are emblematic of a larger problem: the earth is in the midst of what some call the “sixth mass extinction.” Birds, amphibians, freshwater mussels, large mammals, all have seen dwindling numbers. The question for entomologists, Wagner said, is whether or not the decline of insects is actually occurring faster than for some other groups, especially because insects are **often** the **direct target** of destruction by human, due to **pesticide** and **herbicide** use.

Sarah Cornell, a scientist at the Stockholm Resilience Centre (SRC), raises an insect-related question relevant to our time: “There might have been many more mass extinctions. It’s just that we only see extinctions with the things that leave a record… things with skeletons… When people [say], ‘we’re entering the sixth mass extinction.’ Okay, well, how do we know that? We might be entering the 17th?… We might make **ourselves extinct** before we even reach these hallowed glories of the sixth.”

Overshooting planetary boundaries

Clearly, the loss of insect abundance---depending on where and **how fast** it occurs---could have far more **dire, unforeseen impacts** than the loss of coffee or cashews. The wholesale transformation of global ecosystems, triggering **mass** insect declines, could be **pushing** the Earth past what scientists have dubbed as a **“planetary boundary.”**

**The Baltic economy is struggling now due to nervousness about Russia.**

Ian **Johnston 5-23**-2022. "Russia threat deters bond investors from Baltics and Finland ". Financial Times. https://www.ft.com/content/9a9c9c25-819e-408c-a15f-51c3dc25fc05. Pen-DL

Russia’s invasion of Ukraine has sent **jitters** through bond markets **in the Baltics** and Finland, and deterred **international investment** in the region, as fund managers **seek to avoid** geopolitical risks.

Debt investors **are shying** away from Finland, Lithuania, Latvia and Estonia, and showing a preference for other **markets further** from the Russian border, said André Küüsvek, chief executive of the Nordic Investment Bank, which is backed by governments in the region.

“Larger bond funds — the more global funds — say it’s very difficult for them to assess how big the risk is,” Küüsvek said. “It’s **easier** to take a ‘**wait and see’** attitude.”

Appetite for NIB financing started to grow before the war in Ukraine in response to higher inflation and rate rises from central banks, and has increased in 2022, Küüsvek said.

The NIB agreed €1.2bn in loans in the first quarter of 2022, almost five times the amount in the same period of 2021, and an increase of more than 25 per cent on the previous quarter, with the bulk of its financing aimed at companies.

“It’s a combination of high inflation and rate hikes and the geopolitical uncertainties that have mostly **affected** [new bond issues] in the Baltics and Finland”, Küüsvek added.

The **gap** in yields between the region’s government bonds and the debt issued by companies has **widened** of late, reflecting a **greater sense** of **nervousness**.

In government debt markets, the yield on Finland’s benchmark 10-year bond has risen by around 0.8 percentage points since February 24 to 1.4 per cent, according to Tradeweb data. The spread, or riskiness of the bond relative to Europe’s benchmark 10-year German bond, has widened from 0.36 percentage points to 0.46 percentage points over the same period.

Nicolas Forest, global head of fixed income at asset manager Candriam, said he had **downgraded** the countries and **disinvested**, flipping instead to other countries in southern Europe where yields are similar but geopolitical risks are lower.

“If I look at Latvia and Lithuania compared to Spain, does it make sense to invest in a very small country, dependent on Russian oil, when there is an alternative with a similar level of yield in a bigger country?” Forest said.

**Russia hybrid attacks.**

Bartosz **Fraszka** 10-26-20**20**. PhD from the Warsaw School of Economics. "Baltic States Versus Russian Hybrid Threats". Warsaw Institute. https://warsawinstitute.org/baltic-states-versus-russian-hybrid-threats/. Pen-DL

15. Economic security is what is of **critical** importance for the functioning and development of the Baltic countries. Russia consistently balks at infrastructure projects in the Baltic republics––such as Rail Baltica––chiding at them as unprofitable and unsustainable while arguing it develops anti-Russian military infrastructure. Nonetheless, diversifying energy supplies, adding new directions, and expanding the gas pipeline network (Balticconnector) or energy infrastructure projects (EU-wide Connecting Europe Facility) are all **vital** for the security of the Baltic nations. Also, the electricity systems of the Baltic states and Russia are tightly interconnected and integrated into the BRELL (Belarus, Russia, Estonia, Latvia, and Lithuania) electrical grid that enables Russia to control the frequency regulation and thus put pressure on the Baltic countries[24]. The **energy sector** in the Baltics is still **a target** of Russian cyber attacks. Russia is sparing no efforts to make the Baltic republics **fully reliant** on its energy flows while rebuilding the energy security architecture in the Baltic Sea with projects like Nord Stream and its sister gas pipeline Nord Stream 2. Russian feats are also met with resistance from other countries and EU bodies; just to cite here that Germany’s Federal Network Agency rejected the project’s request for a pass from a new EU gas directive[25]. One notable example is also the Belarusian nuclear power plant––located some 55 kilometers off Vilnius––that got funds from Russia and violates international safety requirements. In its report, the International Atomic Energy Agency, or IAEA, wrote that the nuclear facility presents a real threat to the Baltic states and whole Central and Eastern Europe.

**The Baltics solve the circular economy.**

**Borges** et al. **19** [Luciane Aguiar Borges, Shinan Wang, Gustaf Norlén, Alberto Giacometti, Nordregio (Sweden); Maria Toptsidou, Kai Böhme, Clément Corbineau, Sebastian Hans, Christian Lüer, Sandra Spule, Sabine Zillmer, Spatial Foresight (Luxemburg); Klaus Spiekermann, Björn Schwarze, Spiekermann & Wegener, Urban and Regional Research (S&W) (Germany); Tomasz Komornicki, Piotr Rosik, Rafał Wiśniewski, Denis Cerić, Institute of Geography and Spatial Organization Polish Academy of Sciences (IGSO PAS) (Poland); 11-29-2019; " BT2050 Territorial Scenarios for the Baltic Sea Region"; European Spatial Planning Observation Network (ESPON); https://www.espon.eu/sites/default/files/attachments/ESPON%20BT%202050%20\_%20Main%20Report\_0.pdf; KL]

2.2.1 Well-being in a circular economy. A RE-mind for a good life

A metanoia5 to circular economy. By 2050 the Baltic Sea Region has abandoned the linear economic model that had structured the economy in the region and beyond for several years. Linear economy, summarised as the ‘take – make – waste’ model, was based on taking natural resources to make products for different uses, to then discard them as waste (Ellen MacArthur Foundation, n.d.). Realising that resources are not eternal and to maintain resource efficiency, the Baltic Sea Region is the first macro-region in Europe to adopt instead a circular economy model, continuing to be a pioneer in environmental protection. A circular economy can operate at different levels, ranging from a macro-level, i.e. at the city, region, nation or beyond level, to a meso-level, i.e. at eco-industrial parks to a micro level, i.e. at products, companies and consumers level (EESC, 2019). In a circular economy, all resources matter and every waste count. Waste can not only be recycled but also transformed into other forms of resources and new materials, while products can be designed to live longer and be repaired. Circular economy, is, however, not only about reshaping the production model. It is all about changing the mindset of people towards endorsing a sharing, reusing and repairing culture and transforming their lifestyles for their well-being. The well-being of the Baltic Sea Region citizens does not rely on GDP growth, but instead on de-growth and less intense production due to an advanced repairing and sharing culture.

Averting an environmental fallout. The environmental situation in the Baltic Sea Region was at a crucial stage already from the early 2020s. Air pollution created pressure, especially in the urban areas of the region, mainly as a consequence of fossil fuels burning and industrial processes. This had affected especially places in coal transition or highly coal dependant. At the same time, looking at the conservation status of the Baltic Sea marine Natura 2000 habitats, the situation was at risk. Several sandbanks, estuaries and coastal lagoons were heavily endangered in most of the Baltic Sea Region, especially in Germany and Denmark (EESC, 2019). Furthermore, the Baltic Sea used to be the most polluted sea in the world, suffering from eutrophication, where nutrient inputs to the sea resulted in a series of ecosystem changes, mainly due to high shipping traffic and intense agriculture. All these developments stimulated and generated a large civil society action, sparked in 2019 by the ‘Fridays for future’ school movements initiated in Sweden and spread across Europe. At the same time, the UN SDGs recognised the increased demand for natural resources puts a burden on environmental resources and highlight the need for reducing the material footprint and urged for a fundamental shift towards sustainable consumption and production (United Nations Economic and Social Council, 2019). Following these, a strong political and social movement took the big leap: to transform the status quo so as to improve citizens’ quality of life through a paradigm shift to a circular economy.

• Sharing is more than caring. The sharing or collaborative economy is the first key notion prevailing in a circular economy. The sharing culture is recognising its hype by the millennials and the generation Z, who choose access to ownership being more reluctant to buy items but rather favour services that give access to different goods (Goldman Sachs, n.d.). This sharing economy can be organised through sharing business models: sharing products, such as sharing of tools within the local community, sharing of washing machines within blocks of buildings, car-sharing in the case of commuting or longer trips. The development of the socalled ‘time banks’, i.e. a system where people agree to exchange services and different skills without money, using hours as currency, is also one part of the sharing economy. Sharing houses is also common, offering shared apartments, not only as holiday accommodation but as the new living. In addition to these, people do not only share objects and skills. They also share offices working in open work-spaces abandoning the rather centralised working structures of the past.

• Repairing is now a state of mind changing consumption patterns. People do not consume uncontrollably favouring the low prices to high quality. Instead, they adopt new consumption behaviours, where they consciously choose higher quality products, designed and crafted with higher quality resources so as to last longer and be repairable. E-waste, for instance, is either recycled or repaired to be sold at lower prices. This repairing culture is adopted by big and smaller industries offering repairing guarantees, and also in-house repairs are possible, especially given the continuous technological progress. 3D printers are available in local shops, allowing to print smaller parts needed to replace and fix in-house and with limited costs. People organise themselves through online platforms, offering repairing services in different local and urban centres. The repairing economy allows for urban and local communities to revive, as small companies and community initiatives are more networked. Additive manufacturing plays a role in, having an impact on the production localisation and costs and the recycling potential of a different material (ESPAS, 2016) when it comes to larger productions.

• Companies close the circle. Companies or bigger industries specialised in producing from electrics to furniture to clothing adjust their production to the new sharing and repairing economy and the emergence of the ‘prosumer model’ (people produce and consume their products in a rather regional or local scale). Companies produce less, higher quality, hence more expensive, products, to ensure they last longer. They 32 also offer special repair services for the products they produce extending the lives of their products or guarantee that their products can be fully recycled after their use, or that they have used recycled products for the production. Unlike the linear economy where selling of products is the ultimate goal, in a circular economy, companies may rent their materials so that they are returned for reuse, or companies create incentives to guarantee the return (McKinsey Quarterly, 2014). This shift in the different industries is also supported by tax reliefs, allowing them to cope with the competition. Circular-label gives companies more credibility and respect for their social and environmental responsibility. Most smaller shops are also going zero-waste, having abolished any packaging, plastic or paper bags and alike.

• Re-industrialisation through products ‘made in the BSR’. The new consumption and production models shape and form the re-industrialisation in the BSR, as more products are now produced by local communities, in-house or in small scale productions. Products, now being produced in the Baltic Sea Region, labelled as ‘Made in the Baltic Sea Region’ may increase competitiveness and resilience of the regional economy, increase business success, create new jobs and reduce the dependence from global resources, making the BSR less dependent on global changes.

• Digital accessibility is essential. The 4th industrial revolution is a reality, and continuous technological progress is unavoidable in 2050. There is high speed, and accessible internet in all corners of the BSR and everyone in 2050 is a digital native. Online platforms do not only serve as a basis for services exchange. They also function as online support, providing videos with instructions or interactive sessions on how to repair different machines or items, so that people can repair them at home. This becomes particularly handy for the elderly or people in remote areas. Furthermore, AI accelerates the circular economy process, by allowing rapid prototyping and testing when designing circular products or different components, support to increase product circulation when operating circular business models and optimise circular infrastructure through improving the processes of the circular economy loops (Ellen MacArthur Foundation and Google, 2019).

• Eco-vation: an ecological touch to innovation. Eco-vation, i.e. innovation in the area of green economy is also necessary for the circular economy model. Among the eco-innovation leaders have been Sweden, Finland and Denmark, Estonia, but also to a lesser extent Lithuania being average eco-innovation leaders and the rest of the BSR countries catching up. Among the eco-innovation activities belong eco-innovation patents, products exports of eco-industries, value of green early-stage investments and others (European Commission, n.d.) related to building up research on new ways of producing or new solutions to waste management.

• Technology gives employment a new twist. Robotization has taken up, with increasing use of machine learning algorithms and AI. Most of these platforms may be organised through automated algorithms and AI machines without necessarily any human interaction. The technological progress has also changed employment types, where more jobs are automated in the BSR in 2050. Hence ‘technological unemployment’ is also to be expected in the Baltic Sea Region. To balance social inequalities, governments impose higher taxes to the big companies managing the different online platforms. Pigouvian taxes (i.e. taxes on activities generating negative effects) have also be imposed to companies not introducing the circular economy model in their production, or on the contrary give incentives to companies, smaller SMEs or micro-enterprises through tax reliefs or other benefits for introducing circular economy business models (Interreg Baltic Sea Region, 2019).

• Manufacturing is back on track. The shift to a circular economy in the BSR opens new employment opportunities. Although the technological advancements may automate a number of jobs, new jobs related to the new model are created (e.g. repairing or related to high-end innovations, where niche professions are needed). The circular economy model in the Baltic Sea results in a more de-scaled production and consumption that increases the repair industry. This requires people and staff with relevant and specific knowhow. Jobs related especially to manufacturing or similar handcrafting professions will be necessary to accommodate the new regionalised production systems. In addition to the hand-made, higher quality products, manufacturers are also employed in the repairing industry. Such a reviving manufacturing focus puts older professions and hence older people who used to be employed in that sector into the spotlight. In this case, ageing turns into an advantage as the silver economy here plays a role and older people can, on the one hand, teach younger generations those arts, while at the same time continue earning ends meet. In the line of the sharing economy, a lot of voluntary work is also seen. People get engaged in supporting actions for cleaning the environment, being organised in groups to clean streets or beaches, or mobilising the civil society for similar actions. Furthermore, given the more minimalist, localised and regional production, as well as the lower lose their global character and importance in the region and small shops with a rather regional identity flourish. 33

• Bio and organic agricultural production. Agricultural practices have become less intense, and producers focus on more sustainable, bio and organic production where pesticides are banned or reduced to the minimum. This results in a healthier and more sustainable production of food with increasing local farming. People responsively have reduced meat consumption, going rather ‘beyond meat’, vegan or vegetarian and hence reducing the need for arable land (Baltic Ecological Agriculture and Society, n.d.). Sustainable forestry and logging and provision of wood materials are also an important element for the provision of material (ESPON, 2019b). At the same time, urban gardening is also promoted with citizens even in the urban areas being engaged in gardening and very local production activities. Hence, people in the BSR prefer the socalled ‘slow’ food, supporting local food cultures and traditions. Nevertheless, this limits the available sources and cannot cover the needs of the whole BSR, making the reliance on other countries for the import of primary sources a necessity.

• Transportation changes. Due to regionalisation of production, the long livelihood of products, the local food production, sharing culture and the minimalist choice of the way of living, freight transport and logistics become secondary as fewer bulks of products need to be transferred across the region. This specifically regards air, rail and road logistics with the respective hubs losing importance. At the same time, transport becomes more expensive as its importance is reduced. Further logistics means are experimented, such as drone deliveries, especially to the more remote areas. On the other hand, as car sharing is a norm and people choose to use fewer cars and more public transport and bikes where possible, the regional and multi-modal transport increases. Faster, reliable and well-connected public transport is necessary to facilitate people’s transportation when necessary. Given the rather regionalised production and less dependency on global markets, shipping has declined. • Renewables’ added value. The renewable energies capacity is expanded and the main energy source, with especially bioenergy, wind, solar, hydro energy capacity dominating. Furthermore, given the reduced global connections of the region in this scenario, the substitution of fossil fuels with renewables reduces the exposure of the region to global energy prices and changes. Decentralised energy solutions such as small-scale biomass, photovoltaic, wind and hydropower support the ‘prosumer’ model. Renewable energy production creates added value in the income and employment, generated from its production, transformation distribution, as well as manufacturing, R&D and trade (Interreg Baltic Sea Region, 2018). Investments in buildings energy efficiency have also taken place, with better insulation material being used and solar panel windows replacing glass windows.

• The environment is getting better. Natural resources are **highly preserved**, and their exploitation is controlled. Also, eutrophication in the Baltic Sea has reached a good status, as people have become more aware of the environmental consequences of their consumption habits. Back in 2015, it was estimated that about 3.8 – 4.4 billion euros were lost in citizens’ welfare every year due to eutrophication (based on HELCOM, 2018). The increased citizens’ commitment and ‘willingness to pay’ has played a role in improving the environmental conditions in the Baltic Sea Region and thus, their well-being. Environmental valuation methods are applied to see the changes in human welfare due to the effects of the environmental changes looking at the citizens’ willingness to pay for these changes. Furthermore, less mass production, together with the increasing sharing culture and the high % of market share in the collaborative economy, results in a high environmental impact, reducing the environmental footprint of the region in the 2050 (European Commission, 2017). Similarly, the decreased use of cars and aeroplanes and the shift to renewable energy production also resulted in less CO2 emissions reducing air pollution.

• Living a healthier life. A cleaner environment constitutes a precondition for a healthier life. At the same time, technological advancements allow people to live healthier and longer. Specialised medicine built upon nano- , bio- and information technology revolutionise healthcare, delivering high-end and personalised treatment (European Strategy and Policy Analysis System, 2015). This, however, may increase social disparities, as high-end healthcare may be accessible to those citizens who can afford it, causing the reshape of health policies. There is less stress and burnout effects, as a clean and peaceful environment reduces anxiety. ‘Horticultural therapies’ and gardening practices help in relaxing and de-stressing people (Shechet, 2019). People of the Baltic Sea Region aim for happy and healthy life, following and living in practice well-being trends as ‘hygge’ and ‘lagom’ for a life fulfilment and joy, anticipating the UN SDGs of 2019 on ensuring ‘healthy lives and promoting well-being for all at all ages’ (United Nations Economic and Social Council, 2019).

• Educating the new state of mind. A good education is a prerequisite in 2050. First, this is the means towards educating citizens for a more sustainable way of living, starting from recycling to sharing and repairing. Although the education levels remain high in the first levels of education, more specialisation is seen in high school and higher education. Even for the manufacturing jobs, more specialised training and education are 34 necessary, while for the niche innovation jobs, high-quality education is needed. Given the technological progress, massive online courses are a norm, and the majority of people join online courses, leaving the high end and high-quality education only for those who can afford it.

• Well-being in a circular economy. In a circular economy, prosperity and well-being are of utmost importance and goes beyond GDP. It is achieved through improving especially the environment quality, health and government. Especially the latter, together with trust, are key aspects for a circular economy implementation. In a world where technology accelerates and digital technologies prevail, more openness and participation of citizens is possible, bringing at the same time more responsibility, accountability and transparency of the different players of society (European Commission, Joint Research Centre, 2019). Hence a political and social will are necessary to achieve a mindset shift towards a circular economy that goes beyond resource management and waste reduction (ESPON, 2018b) and finds eudaemonia in a ‘less is more’ attitude.

• New virtue values? Peoples’ lifestyles have transformed towards a way of living that is in full accordance with nature. This virtuous life, following the virtual ethics as expressed by the Stoic philosophers, aims at improving the quality of life and the well-being of people, who have chosen to live in harmony with their overall environment. A new societal model has emerged, where people share more and consciously change their consumption habits for the common good and environmental sustainability. Good government has contributed to achieving better life fulfilment by introducing policies that support such actions and improve the life index of people through caring about the environment, housing, income, jobs, work-life balance for more life satisfaction and community building. (based on OECD, 2017)

• Neighbours relation: together we stand. Cooperation on the transition towards a sustainable economy was highlighted as a common priority focus area for the Baltic Sea Region in the Baltic 2030 Action Plan. The Sustainable Development Goals related to ‘zero hunger’, ‘industry, innovation and infrastructure’, clean water and sanitation’, ‘responsible consumption and production’, ‘affordable and clean energy’, ‘life below water’ and ‘decent work and economic growth’ have taken up and cooperation both within the Baltic Sea Region, as well as with its Russian and Belarussian neighbours has increased so as to reduce waste, adopt more sustainable production and consumption patterns and lifestyles, more sustainable agriculture, protect the ecosystems and reduce water pollution, support among others, green and blue economies (Council of the Baltic Sea States, 2017). Furthermore, there is still energy dependency from the Russian market, to a much lesser extent, though, than 30 years ago.

• United in diversity in the European Union. The BSR is not an island. European Union policies continue playing an important role in the BSR in 2050 and shape the future where possible. Policies related to improving waste management, recycling, plastic bans and circular economy are largely taken up by Baltic Sea Region policymakers, as also do new developments in the Common Agricultural Policy, towards more sustainable agriculture and policies around renewable energies and reduction of CO2 emissions. Cooperation with other regions and involvement in transnational and cross-border programmes within the BSR, but also beyond are necessary. Cohesion Policy needs to be further strengthened in the region to reduce spatial disparities that are also possible in this scenario. At the same time, policies that can strengthen the competitiveness of the region are needed, given the highly decentralised and regionalised territorial character of the circular economy.

**The Baltics are the mecca for innovation. Collaboration solves.**

**Baltis 21** [Lucas Baltis, reporter; 2-11-2021; "Baltic States – the new Mecca for innovation and technology in Europe?"; *The Baltic Times*; https://www.baltictimes.com/baltic\_states\_\_\_the\_new\_mecca\_for\_innovation\_and\_technology\_in\_europe\_/; KL]

Is the Baltic States really the new Mecca for innovation and technology? That question was among a number discussed at an international online conference where representatives of five countries of the Baltic Sea Region—Lithuania, Latvia, Estonia, Poland and Germany—deliberated the changes to the political, economic and business landscapes, as well change and crisis management strategies.

**Renowned experts** in fields as **diverse** as politics, diplomacy, economy, business and trade, **foreign affairs**, regulatory compliance, **technology** and **innovation**, as well as consultancy agencies, together concluded that the pandemic had had significant effects on the region’s future. The reflection can be summarized as: "Things will never be as they were, therefore we need to work together in order to provide the best possible outcomes for our businesses and comunitites.”

The strategic dialogue revealed that advancements in digitalisation have **sped up** by five to ten years as a result of the pandemic and the EU Green Deal initiative, yet they have also brought new challenges. Therefore, the need for alignment on strategic transformations were discussed, at the centre of which should be region-wide cooperation and change management strategies for all areas of life.

Progress in the region is hampered by competition

The Honorary Consul of the Republic of Lithuania in Hamburg, Dr. Dietmar O. Reich, noted that Baltic States are often described as a “**Mecca**” for **innovation** in the world. International investors are drawn to the region’s **laser** and **technology** sector, as well as the **strong conditions** for **start-ups** that exist there, and development of **IT** and **innovations**. Internal competition, however, is limting progress for the entire region.

Global Change Expert, CEO and Founder of ADMIS Consultancy, Vaiva Adomaityte, stated: “If the entire **B**altic **S**ea **R**egion **collaborates** to centralise their strategic investment management functions and international commerce, as well as streamlining economic development projects, they could become a **very strong** independent economic bloc.”

According to the Chairman of the Foreign Affairs Committee at the Parliament of the Republic of Latvia, Rihards Kols, projects such as GovTech Lab in Lithuania, e-Residency in Estonia and the e-Parliament model in Latvia, which went live in May 2020, are among a number of examples of how a model created in one country can be successfully transferred and implemented in another country, thereby achieving greater alignment and mutual progress.

The pandemic has demonstrated the growing need to diversify partnerships in order to create more opportunities and build more resilient models. Discussions at the conference thus sought out ways to improve cooperation mechanisms within the Baltic region and the wider EU, and with other countries globally, including in Asia and Africa. At the same time, relations with neighbouring Russia remain **complicated** due to **political tensions**, and do not currently allow for the building of **stable partnerships**, despite the mutual benefits those could bring.

It is necessary to change govarnance models to foreground an agile and socially responsible strategy

In times of **seismic change**, **major political** decisions can only be implemented if they are **accepted by society**. Adomaityte highlighted how recent global events demanded a strategic shift among governments towards social responsibility.

Alexander Kulitz, a member of Parliament at the German Bundestag in his speech about Germanies preparedness to face the challenges of the 21st century noted: “it is important to allow the economy to breathe for it to grow”. Kulitz urged the importance of **digitalisation** in countries governance and in the overall **B**altic **S**ea **R**egion strategy.

Result of the dialogue: 500 expert recommendations

The objective of the research study, international Baltic Sea Region debates and questions answered by **500 experts** from Lithuania, Latvia, Estonia, Germany and Poland- is to create a report containing strategies and recommendations on the current situation and suggesting key priorities for international collaboration, while outlining a joint economic strategy for the Baltic Sea Region countries.

“The **potential** of the **B**altic **S**ea **R**egion has been mentioned in Germany’s strategic business development plans for quite a long time and the first priority should be to strengthen geopolitical relations so that close cooperation emerges,” the Chairman of the Board of Federal Association for Economic Development and Foreign Trade (BWA), Michael Schumann, stated.

**Absent strengthened US guarantees, prolif is inevitable.**

**Keating 22** [Joshua Keating, global security reporter for Grid focused on conflict, diplomacy and foreign policy. He is the author of the book, "Invisible Countries: Journeys to the Edge of Nationhood." Joshua was previously the international editor at Slate and an editor at Foreign Policy. His work has been published by the New York Times, Washington Post, Politico and the Guardian. He is a graduate of Oberlin College; 6-1-2022; "Will more countries want nuclear weapons after the war in Ukraine?"; Grid News; https://www.grid.news/story/global/2022/06/01/will-more-countries-want-nuclear-weapons-after-the-war-in-ukraine/; KL]

But recent events have raised **troubling signs** that the norms against nuclear weapons proliferation are **breaking down** and that more countries may see it in their interest to acquire them. Governments looking at Ukraine and Russia may well conclude that a nuclear arsenal can help a powerful state **impose its will** on its neighbor. And they may look at North Korea and see how even the most erratic and isolated rogue regime can acquire a degree of international clout by building a nuclear arsenal.

And as these norms break down, the bigger concern is that the norms against the use of nuclear weapons could follow.

“The more states that pursue nuclear weapons, that threaten to pursue nuclear weapons, that threaten to use nuclear weapons, all of that increases **nuclear risk**, in part because it increases the risk of **miscalc**ulation,” Kelsey Davenport, director of nonproliferation policy at the Arms Control Association, told Grid.

Where are these risks most acute? And what can be done to contain them?

Ukraine

On the one hand, if anything demonstrates the dangers of a world with nuclear weapons, it’s the war in Ukraine. And yet, it’s also a demonstration of why countries want to have them. Russia’s nuclear arsenal is one big reason why it has been able to invade a neighboring country (a relatively rare event in today’s world) without facing an international military response.

It also seems far less likely that Russia would have invaded had Ukraine possessed a nuclear arsenal of its own. Compounding the frustration for Ukrainians is the fact that the country did have nuclear weapons on its territory — around 1,900 Soviet warheads at the end of the Cold War in 1991, making it, on paper, the world’s third-largest nuclear power. In 1994, the newly independent nation of Ukraine agreed to give those weapons to Russia in exchange for internationally negotiated security guarantees that turned out to not be so ironclad. While Ukraine never actually had control of the weapons, which were connected to command-and-control systems in Moscow, it’s a powerful narrative nonetheless. As the country’s former defense minister told the New York Times in February, shortly before the invasion, “We gave away the capability for nothing.”

Nicholas Miller, a political scientist at Dartmouth College who studies nuclear proliferation, said the current war and recent history underline the advantages of the nuclear capability. “It’s already well understood that nuclear weapons seem to do a pretty good job at deterring outright invasions,” he told Grid, pointing out that North Korean officials regularly invoke the examples of Iraq and Libya, which abandoned their weapons of mass destruction programs and then found themselves targets of U.S.-led regime change operations. “This just kind of reinforces that.”

None of which suggests a looming global rush to obtain the bomb. Davenport said the more likely possibility is more states engaging in nuclear “hedging”: developing the capabilities to quickly build a bomb without crossing the red line of actually doing so. Countries have done this as an insurance policy in case security guarantees provided by their partners turn out not to be flawed, or weak. Japan and Germany are often cited as examples of this “hedging” strategy.

Another potential casualty of the war in Ukraine is nuclear diplomacy between countries that already have the weapons. Just after Biden took office in January 2021, he and Russian President Vladimir Putin reached a last-minute agreement to extend the New START treaty by five years. The deal, which was signed in 2010 and limits each country to 1,550 deployed nuclear weapons, was set to expire in February 2021. Notably, the U.S. and Russia have continued to provide each other with regular updates about their nuclear forces, as required under the treaty, even amid the carnage and saber-rattling of the war in Ukraine.

But it’s now much harder to imagine any serious progress on arms control diplomacy. The New START treaty will formally expire in 2026, and Ankit Panda, senior fellow in the nuclear policy program at the Carnegie Endowment for International Peace, told Grid “it’s incredibly difficult for me to imagine the U.S. Senate being in any mood to sort of approve an arms control agreement with Russia that isn’t anything but completely in the United States’ asymmetric favor. And that just isn’t how these agreements play out in practice.”

Without progress, the New START deal and any potential future U.S.-Russia arms-reduction agreements will be at risk.

Iran and the Middle East

The negotiations over a revival of the Iran nuclear deal have been on life support for so long, it sometimes seems like they will never actually die. But at the moment, it’s hard to see a path forward toward an agreement. The current sticking point is Iran’s demand that the Biden administration remove the country’s Revolutionary Guard Corps from the U.S. terrorist blacklist, where Trump placed it in 2019.

Biden has reportedly made a final decision not to delist the group, which is accused of repressing dissent within Iran and fomenting violence throughout the Middle East. While the two sides appeared to be on the verge of an agreement as recently as March, talks are now deadlocked, and the other parties to the landmark nuclear pact are getting nervous. “Every day which passes without achieving agreement, the risk to lose everything increases considerably,” one European diplomat told the journalist Laura Rozen. Even the chief U.S. negotiator, Rob Malley, conceded in congressional testimony last week that “the odds of a successful negotiation are lower than the odds of failure.”

The stakes are high. Since the U.S. quit the pact, Iran has been ramping up the enrichment activities that the agreement prohibited. A report from the International Atomic Energy Agency this week reportedly concludes that Iran now likely has enough enriched uranium to allow it to build a weapon and could convert that uranium to weapons-grade material in just a few weeks. Does this mean that failure at the negotiating table will lead inevitably to a nuclear-armed Iran? Not necessarily. Some experts believe Iran, which still denies it has any intention of building a bomb, is also pursuing a hedging strategy, stopping just short of doing so. In this scenario, Iran would avoid the additional sanctions and isolation that would result from actually going nuclear, while preserving the option to do so quickly were conditions to change.

If Iran did actually build a bomb, the risk of a regional arms race would spiral. Crown Prince Mohammed Bin Salman, the de facto ruler of Saudi Arabia, Iran’s regional rival, has explicitly said that “if Iran developed a nuclear bomb, we will follow suit as soon as possible.” U.S. intelligence agencies have reportedly been scrutinizing Saudi Arabia efforts to produce nuclear fuel, allegedly assisted by China; these remain far short of what would be needed to produce a bomb, but some experts believe they represent a way for the kingdom to keep its options open. Recep Tayyip Erdogan, president of Turkey, which hosts a number of U.S. nuclear weapons on its territory, has also talked openly about developing a nuclear deterrent.

For the time being, the only nuclear power in the Middle East is Israel, and it would like to keep it that way. Israel has possessed weapons since the 1960s, though it does not publicly acknowledge that fact. Israel has been linked to an ongoing campaign of sabotage and assassination targeting Iran’s nuclear program, including the killing of the country’s top nuclear scientist with a remote-controlled machine gun last year. Israel has also carried out drills simulating a military strike on Iran’s nuclear program. There’s reason to think this is not an idle threat: In previous decades, Israel has carried out airstrikes on suspected nuclear sites in Syria and Iraq.

This highlights one of the drawbacks of the “hedging” strategy: If a country is close to developing a nuclear deterrent without actually acquiring one, it increases rather than decreases its risk of being attacked.

East Asia

North Korea became the world’s ninth nuclear power in 2006, and as much as the rest of the world may not like it, there’s little chance it will give up its nuclear status as long as the Kim regime is in power. From the North Korean perspective, nuclear weapons represent a powerful hedge against foreign invasion or regime change, and allow the country to exert pressure and extract concessions from the U.S. and its neighbors.

Would those neighbors be better off with nuclear weapons of their own? Most South Koreans think so. About 70 percent support their country developing its own nuclear deterrent, according to recent polls. South Korea had a nuclear weapons program in the 1970s but gave it up under heavy pressure from the U.S. The country also hosted a number of U.S. nukes from 1958 until 1991, and the U.S. continues to provide security guarantees to South Korea, under what is often referred to as the “nuclear umbrella.”

Still, the polls suggest many Koreans would prefer to have their own nuclear program, for the autonomy and prestige it would afford. Notably, many of those who support a nuclear deterrent see China rather than North Korea as the country’s biggest national security threat going forward. (China’s nuclear arsenal is still tiny compared with the U.S. and Russia, but the Pentagon assesses it could quadruple by the end of this decade.)

The politics are starkly different in Japan, the only country where a nuclear bomb has ever been dropped and where public opposition to their use remains high. Nonetheless, Japan has a highly developed nuclear enrichment program and enough materials to produce a bomb in about six months, a state of affairs that has been dubbed its “bomb in the basement.”

Then there is Taiwan, where fears of conflict run high. An increasing number of prominent commentators in both Washington and Taipei are now also calling for Taiwan to develop a nuclear deterrent, rather than rely on security guarantees from Washington, no matter how forcefully Biden might articulate them. The lessons of the war in Ukraine may only reinforce such jitters and increase the calls for a nuclear capability.

U.S. credibility

**Ultimately**, when it comes to nuclear proliferation, the **most important** country to watch may be the **U.S**. Most proliferation scholars argue that countries tend to build nuclear weapons not only when they feel threatened from abroad, but also when they cannot count on **security guarantees**. And for many countries, the most important such guarantee involves the United States.

This isn’t a new problem. France decided to develop a nuclear deterrent of its own in the 1950s and 1960s over concerns about the reliability of U.S. security guarantees. President Charles de Gaulle famously asked John F. Kennedy if the U.S. would be really be willing to “trade New York for Paris” in the event of a Soviet attack.

The concept of “**extended deterrence**” — the ability of U.S. military power to **deter attacks** against its allies — looks **less ironclad** after the presidency of Trump, who repeatedly questioned the value of alliances with **NATO** and individual nations including **Japan** and **South Korea**. Trump denigrated those countries as **freeloaders**, suggested they develop nuclear weapons of their own and may well have pushed to **withdraw** the U.S. from NATO had he won a second term, according to senior officials, including former national security adviser John Bolton.

“For pretty much any country that is a beneficiary of American extended deterrence, the most important national security issue is American domestic politics,“ said Panda, of the Carnegie Endowment. “All their military planning flows from this idea that at the end of the day, American presidents would probably come to their assistance. So, I think this ‘America First’ thinking really does cause a great degree of concern in many of these countries.”

Perhaps the Trump years were an **aberration**. For one thing, there is now strong (though not universal) bipartisan support for military aid to Ukraine. But it’s worth noting that **no existing** alliances or prewar **pledges** of support were enough to deter Putin, and Ukraine had none of the mutual defense guarantees enjoyed by members of NATO or some U.S. allies in East Asia.

In the wake of Russia’s invasion, **other countries** facing the threat of attack and invasion are likely to seek protection and security guarantees. If the U.S. and other major powers don’t want those guarantees to involve **nuclear weapons**, they need to show that there are **alternative sources** of security — and that they **actually work**. If not, a **new race** for nuclear weapons may be on the **horizon**.

**Proliferation now.**

Kartike **Garg 7-10**-2022. International Relations and Area Studies, School of International Studies. Rahul Jaybhay. "After Ukraine, Will More Countries Want Nukes?". National Interest. https://nationalinterest.org/blog/buzz/after-ukraine-will-more-countries-want-nukes-203474. Pen-DL

With Russia's invasion of Ukraine, the **stability** of Europe has been **shattered**. After four months of the “special operation” launched by Vladimir Putin on February 24 to “demilitarize and de-nazify Ukraine,” the liberal international order is in disarray. The devastation in Ukraine with total casualties of more than 10,000 civilians and tens of thousands of soldiers has **resuscitated** the debate of whether **relinquishing** nuclear weapons landed Ukraine in this terrible situation.

In 1994, under the **Budapest** memorandum, Ukraine, Belarus, and Kazakhstan returned almost 2,000 nuclear weapons to Russia, although Ukraine never had operational control over the weapons. Politically, Ukraine’s decision to hand over nuclear weapons to Russia allowed Kyiv to sign the Nuclear Non-Proliferation Treaty. Russia would also likely have perceived Kyiv’s nuclear arsenal as a threat, inflating regional insecurities. More so, housing nukes could have attracted severe international economic punishment, which would have curtailed the prospects of Ukraine’s post-Cold War economic growth.

**However, today** Ukraine might be wondering whether keeping its nuclear weapons would have been a **better** idea. The West's **reticence** to provide **timely help** to Ukraine could be persuading **other states** to do so.

The West’s sympathy for Ukraine and support through sanctions on Russia shows an appreciation for Kyiv’s dire situation. But the West does not want to get too involved in the war or risk provoking Russia. Direct intervention would escalate the conflict, as the West’s involvement will be interpreted by Moscow as seeking a “total defeat” of Russia. The fear of getting entrapped in such a situation precludes NATO from providing full-fledged support to Ukraine. Since NATO military aid is still **inadequate**, though generous, it will embolden Ukraine to help itself and end up in the quest to acquire nuclear weapons.

Other states **are suspicious** of Washington’s **commitment to** keep them “dry” under the cover of its nuclear umbrella. As more states like Finland and Sweden join NATO, the reluctance of the United States “**to trade** New York” for Helsinki or Stockholm in a nuclear confrontation **will increase**. Fearing American abandonment, states like Germany and Japan that **already** maintain **latent nuclear** capabilities will **activate** them.

The neutral states turning to the West have increased Washington’s responsibility to navigate the risks posed by the Russo-Ukrainian War carefully. The West's disposition, ultimately, will be a litmus test of its credibility as a reliable partner. Failing to **assuage** their fears, the states observing the plight of Ukraine may **seriously consider** going nuclear. Sweden, by applying for NATO membership, is hedging against future risks. After World War II, Swedish policymakers discontinued the development of nukes due to domestic constraints. But the possibility of further Russian aggression and the fear of American abandonment will **compel** Sweden to resume its **dormant mission**.

Kyiv's vulnerability **is enough** to propel other states to pursue nuclear weapons as the **most strategic** optimal choice for **self-preservation**. Since nuclear weapons are a “defensive weapon **par excellence**”, Kyiv could have leveraged its nuclear capability to **blackmail** the Russian regime into backing down. If Russia failed to oblige, the threats of using nuclear weapons to inflict heavy damage on the other side would have been enough to discourage Russian aggression. Such coercive nuclear tactics are easily discernible in the case of North Korea, which has not shied away from invoking nuclear threats to achieve political objectives. **Today**, the lack of security assurances from NATO and the United States might drive Kyiv to find **solace** in nuclear weapons while also **emboldening** other states like **Japan** and **South Korea** to follow a **similar strategy**.

Despite Ukraine’s past decision to give up nuclear weapons, Kyiv may be wondering now about the fallacy of such a decision. Bearing the brunt of the invasion, Ukraine could have alerted Moscow by signaling its reliance on nuclear weapons. If threatened states, as Vipin Narang explained in his book Seeking the Bomb: Strategies of Nuclear Proliferation, anticipate the plausibility of coercion from other powers, they will pursue technical capabilities to develop a nuclear weapon no matter the challenges involved. Further, technological constraints **rarely obstruct** a state’s pursuit of nuclear weapons. States like **Syria,** **Taiwan**, and **South Africa** all tried to acquire nuclear weapons **clandestinely** by generating the necessary **technical** capabilities. Others failed, but South Africa **did succeed**. Nuclear weapons could have forestalled Russian aggression.

The whole Russia-Ukraine crisis has caught Washington between a rock and a hard place. Washington will **have to navigate** this geopolitical **tightrope** cautiously. Russian threats have **created anxiety** in most states, demanding a **more credible** commitment from the United States. While assurances may have mattered before, allies will now **demand** more tangible commitments. Failing to do that will **ensure** greater nuclear proliferation which may ensure peace but could also be more menacing if not handled responsibly.

**Ukraine’s the brink.**

**Umland** and Von Essen **22** [Andreas Umland, an analyst at the Swedish Institute of International Affairs; Hugo von Essen, an analyst at the Swedish Institute of International Affairs; 3-21-2022; "Putin’s War Is a Death Blow to Nuclear Nonproliferation"; Foreign Policy; https://foreignpolicy.com/2022/03/21/nuclear-weapons-war-russia-ukraine-putin-nonproliferation-treaty-npt/; KL]

One of the most dangerous and far-reaching repercussions of Russia’s invasion of Ukraine is the subversion of the Nuclear Non-Proliferation Treaty (NPT)—perhaps the most critical multilateral agreement for the survival of humanity. Since its first attack on Ukraine in 2014, Russia’s actions have put the logic of the treaty to prevent the spread of atomic weapons on its head. Because Ukraine once possessed nuclear weapons but gave them up when it joined the NPT in 1994, Russia’s renewed aggression makes it look as if the treaty’s purpose is to keep weak countries defenseless and prey to the nuclear-weapon states. Russian President Vladimir Putin said as much at the start of the war, when he announced that he had put his country’s nuclear forces on alert and issued ominous threats to anyone daring to get in Russia’s way.

In the early 1990s, newly independent Ukraine briefly possessed more nuclear warheads than Britain, France, and China combined. Ukraine had inherited from the Soviet Union some 1,900 strategic and 2,500 tactical nuclear weapons stationed on its territory. However, against the background of the 1986 Chernobyl nuclear disaster and in the spirit of the geopolitical optimism of the early post-Cold War years, Kyiv decided that Ukraine would become entirely free of nuclear weapons.

To be sure, Ukraine was unable to use most of its nuclear weapons at the time, as the command centers were still in Moscow. Yet it had accumulated not just the warheads, but also the specialized technology and engineering expertise it could easily have used to be a nuclear weapons state—by keeping a reserve of enriched uranium or plutonium, or even nuclear ammunition and warheads. Under considerable pressure from Moscow but also with generous help from Washington, Kyiv quickly transferred its entire nuclear arsenal to Russia. Ukraine signed and ratified the NPT as a non-nuclear state.

In exchange for full denuclearization, Washington, Moscow, and London agreed to provide Kyiv with additional security pledges. At a summit of the Conference for Security and Co-operation in Europe (the predecessor of today’s Organization for Security and Co-operation in Europe) in 1994, the four countries signed the now-famous Budapest Memorandum, named for the city where the summit was held. In this document, the nonproliferation regime’s three guarantor powers—the United States, Britain, and Russia (as the legal successor of the Soviet Union)—assured Ukraine of its sovereignty, the security of its territory, and its freedom from economic and political pressure.

The two other official nuclear-weapon states under the NPT, China and France, followed suit. They provided Ukraine with separate governmental declarations expressing their respect for Ukraine’s state and borders. Similar written pledges were made to Belarus and Kazakhstan, two other post-Soviet states that had inherited parts of the Soviet nuclear arsenal. The two countries also agreed to transfer their warheads to Russia.

The NPT—which has been signed by 191 countries, more than any other arms control agreement—was finalized in 1968 and went into effect in 1970. The treaty’s goal is to avert the spread of nuclear weapons, foster cooperation on the peaceful uses of nuclear energy, and work toward complete nuclear disarmament. It was extended indefinitely in 1995, not the least against the background of the successful denuclearization of Ukraine, Belarus, and Kazakhstan.

The NPT is the bedrock of the global nuclear nonproliferation regime. It contains the only binding commitment to the goal of disarmament by the nuclear-weapon states. The agreement explicitly acknowledges that preventing the proliferation of nuclear weapons cannot be achieved by individual states but requires the dedication and collaboration of the global community.

The NPT also contains the obligation of nuclear-weapon states to not transfer nuclear arms to other states—and of non-nuclear-weapon states to refrain from receiving, manufacturing, or acquiring nuclear weapons. It includes a promise by nuclear-weapon states to help promote the development of civilian nuclear applications of all treaty parties. In its preamble, the NPT recalls that countries must refrain, in accordance with the United Nations Charter, “from the threat or use of force against the territorial integrity or political independence of any State.”

The effect of the nonproliferation regime has so far been that the vast majority of countries have abstained from acquiring atomic arms. Outside the NPT, only India, Israel, North Korea, and Pakistan have developed their own nuclear weapons capability. However, their arsenals are smaller than those of the NPT’s five official nuclear-weapon states: Britain, China, France, Russia, and the United States, which are also permanent U.N. Security Council members. More than half a century after its signing, the NPT remains largely intact. Its 10th review conference is scheduled for later this year after several postponements due to the coronavirus pandemic.

With Russia’s military and nonmilitary attacks on Ukraine since 2014, the seizure and annexation of Ukrainian territory, and the ongoing invasion, the Kremlin has put the logic of the nonproliferation regime on its head. With the nuclear-weapon states’ security guarantee to Ukraine so obviously worthless, it looks now as if the NPT’s purpose is to provide the five official nuclear-weapon states—which happen to be the world’s strongest conventional military powers as well—with an opportunity to extend, at relatively low cost, their territories. They can do so at the expense of smaller nations naive enough to believe in the rule of international law, which have signed the NPT as non-nuclear-weapon states.

Russia’s behavior toward Ukraine since 2014 is thus a threat to the integrity of the NPT, the global order of which it is a foundation, and the security of the NPT’s 191 signatories, including Russia itself. By so obviously breaking the NPT, Russia has severely undermined worldwide faith in the plausibility of nonproliferation, diminished the will of individual states to participate in its pursuit, and increased the potential and temptation for additional states and nonstate actors to acquire and use nuclear weapons. Russia’s attacks on and dismemberment of Ukraine thus erode the security of all.

What long-term incentives will Russia’s renewed attack on Ukraine create?

Russia was able to attack Ukraine because the former is a nuclear-weapon state. Not only does Ukraine lack these arms to deter an attack, but it is also forbidden by the NPT to obtain them. Were Ukraine a nuclear power, Putin and his military leaders surely would have thought twice before launching their invasion.

Middle powers not protected by larger alliances such as NATO can learn three simple lessons. First, it is good to have nuclear weapons—either to advance your designs on another country’s territory or to deter just such an attack. Second, it is not good to give your weapons away. Third, it makes little sense to rely on treaties, memoranda, assurances, and other statements—even if they are fully ratified, legally binding, and supported by the governments of the world’s most powerful countries.

For many countries, the lesson will be to follow a wiser policy than Kyiv did when it gave away its warheads and nuclear material. Instead, a country’s chances to stay sovereign and keep its territory intact will be higher if it obtains and keeps nuclear warheads. Starting a new nuclear weapons program isn’t easy today, but once a new, disruptive technology makes it easier to develop or buy nuclear weapons, many countries will want to get them—all the more so if they have a rapacious neighbor that already has such weapons or that they suspect of wanting to get some.

For that rapacious neighbor, the lesson is that it might get a chance to grab a piece of another country lacking sufficiently deadly arms and naively trusting international law. Following Putin’s playbook, resolute threats to use nuclear warheads will make sure that no outside powers will come to the help of a non-nuclear neighbor that’s under attack. Russia has shown that an attacker with nuclear arms is fundamentally safe. Even far short of a full-scale invasion, Russian behavior in Georgia and elsewhere demonstrates again and again that it can act with impunity, with a few minor arms deliveries and economic sanctions the worst possible reaction by outside powers—and even those sanctions are usually weak and abolished over time.

What else do you need to know to find the bomb an attractive solution?

**Uniqueness CP---AT: TNW Withdrawal Solves**

**The UK and France will launch nukes.**

**NATO 20** [NATO; 2-2020; "NATO Nuclear Deterrence"; https://www.nato.int/nato\_static\_fl2014/assets/pdf/2020/2/pdf/200224-factsheet-nuclear-en.pdf; KL]

NATO Nuclear Deterrence

**Nuclear deterrence** has been at the **core** of NATO’s collective defence for 70 years.

In an uncertain world, nuclear weapons continue to play a critical role in NATO’s deterrence and defence. The purpose of NATO’s nuclear capability is to preserve peace, prevent coercion, and deter aggression.

Nuclear weapons are unique, and the circumstances in which NATO might contemplate the use of them are extremely remote. However, if the **fundamental security** of **any Ally** were to be threatened, NATO has the capabilities and **resolve** to defend itself – including with **nuclear weapons**.

NATO is committed to creating the conditions for a world without nuclear weapons, in line with Allies’ commitments to the Non-Proliferation Treaty. Since the end of the Cold War, the number of nuclear weapons available to NATO in Europe has been reduced dramatically, by around 90 percent.

However, as long as nuclear weapons exist, NATO will remain a **nuclear Alliance** and Allies will continue to take all steps necessary to ensure NATO’s nuclear deterrent remains safe, secure and effective.

Nuclear Forces

Three NATO members - the United States, **France** and the **U**nited **K**ingdom – have nuclear weapons.

The strategic forces of the Alliance, particularly those of the United States, are the supreme guarantee of the Alliance’s security. The **independent** strategic nuclear forces of the **U**nited **K**ingdom and **France** have a deterrent role of their **own** and contribute **significantly** to the **overall security** of the Alliance.

**Cyber ADV CP---Solvency**

**A formal T-12 is too bureaucratized.**

**Goodman** and Roberts **21** [Matthew P. Goodman, senior vice president for economics and holds the Simon Chair in Political Economy at CSIS. The CSIS Economics Program, which he directs, focuses on international economic policy and global economic governance. Before joining CSIS in 2012, Goodman served as director for international economics on the National Security Council staff, helping the president prepare for global and regional summits, including the G20, Asia-Pacific Economic Cooperation (APEC), and East Asia Summit. Prior to the White House, Goodman was senior adviser to the undersecretary for economic affairs at the U.S. Department of State. Before joining the Obama administration in 2009, he worked for five years at Albright Stonebridge Group, where he was managing director for Asia. From 2002 to 2004, he served at the White House as director for Asian economic affairs on the National Security Council staff. Prior to that, he spent five years at Goldman, Sachs & Co., heading the bank’s government affairs operations in Tokyo and London. From 1988 to 1997, he worked as an international economist at the U.S. Treasury Department, including five years as financial attaché at the U.S. embassy in Tokyo. Goodman holds an M.A. in international relations from the Johns Hopkins School of Advanced International Studies (SAIS) and a B.Sc. in economics from the London School of Economics and Political Science (LSE). He is a life member of the Council on Foreign Relations and chairman emeritus of the board of trustees of the Japan-America Society of Washington, D.C.; Brooke Roberts; 10-13-2021; "Toward a T12: Putting Allied Technology Cooperation into Practice"; CSIS; https://www.csis.org/analysis/toward-t12-putting-allied-technology-cooperation-practice; KL]

Progress on these domestic organizational and messaging challenges will need to be complemented by work to organize international cooperation on technology promotion. Again, the Biden administration has made a good start on agenda setting in the Quad and G7 and with bilateral partners such as Japan, South Korea, and Germany. It has **wisely avoided** calling for a **single** T12 forum with a **predetermined group** of countries; the kind of “**variable geometry**” it has been promoting is **more suited** to an issue area with a **complex mix** of critical technologies and country capabilities.

**Techno-democracies fail.**

**Webster** and Sherman **21** [Graham Webster, Research Scholar at the Stanford University Cyber Policy Center and Editor in Chief of the Stanford DigiChina Project; Justin Sherman, Nonresident Fellow at the Atlantic Council’s Cyber Statecraft Initiative and a contributor at WIRED magazine; 10-28-2021; "The Fall and Rise of Techno-Globalism"; Foreign Affairs; https://www.foreignaffairs.com/articles/world/2021-10-28/fall-and-rise-techno-globalism; KL]

Two key words were missing from the statements that followed the inaugural in-person summit in September of the Quadrilateral Security Dialogue, also known as the Quad, which features Australia, India, Japan, and the United States. The first absent word was predictable: “China.” Although the country’s growing strength is the clear geopolitical impetus for this Indo-Pacific grouping, officials are at pains to portray their efforts as positive and not about containing a rival. The other omitted word, however, was both less obvious and more important. The four governments released a set of joint principles on technology, emphasizing shared values, fair competition, and an “open, accessible, and secure technology ecosystem.” That rhetoric may sound familiar enough from four countries meeting to champion a “free, open, rules-based order.” But for years, each of these governments, almost reflexively, would also have advocated for an even bigger technological vision: a “global” one.

Almost from its inception, idealists saw in the Internet the radical potential to help bridge divides among people. Digital connectivity spread rapidly during the heady post–Cold War period in which globalization surged and democracy, to many, seemed triumphant. Techno-globalism took root as an ideal among diplomats, scholars, and technologists who believed in free and open exchange both as a virtue in and of itself and as a means to spread political and economic freedoms.

The most utopian techno-globalist visions were never realized. Indeed, one reason political leaders embraced a free and open global Internet was to advocate against efforts to wall off parts of the Web: authoritarian governments, especially in China, worked quickly and effectively to erect digital barriers that prevented their citizens from freely accessing the Internet. Even as U.S. diplomats preached openness, the country’s defense and intelligence sectors perceived new risks and used the Internet to advance more parochial national security interests. Today, far short of the leveled playing field many hoped for, access to the Internet and the benefits that flow from it remains highly unequal around the world.

The recent statements and actions at the Quad and beyond suggest that many long-standing supporters of a global Internet now have moved toward a new vision of technological development: a world fractured between competing national or ideological blocs, each relying on its own trusted hardware and software suppliers to defend against malign interference. To abandon the global ideal in favor of clubs of techno-democracies or techno-autocracies, however, is to abandon a crucial recognition of the Internet age—that despite real divides, humanity and its technologies are stubbornly interconnected.

A permanent technological divide is **unlikely**, **costly**, and **impractical**. Moreover, it is **undesirable**. Without **interdependence**, rivals will treat each other with **less restraint**, increasing the likelihood of **serious confrontation**. The United States already has a special responsibility to think in global terms about the Internet and digital technology; from Facebook to Google, American titans of industry bestride the world. The Internet’s ability to advance human rights may have been hugely exaggerated, but its capacity to do harm has not, and Washington must think and act globally in keeping its technology giants in check.

THE DUSK OF TECHNO-GLOBALISM

Like it or not, the Internet and its associated technologies are **global endeavors**. Their development—especially in the United States—has depended on human ingenuity, raw materials, and labor sourced from around the world. They have required **knowledge sharing**, **o**pen-**source** development, and **scientific collaboration** across borders. Internet technology’s most radical contribution to history—near-instantaneous communications networks that reach a huge portion of humanity—relies upon fiber-optic cables that span borders and traverse the sea floor, a place the UN Convention on the Law of the Sea dubs “the common heritage of mankind.”

For decades, diplomats and intellectuals from the United States and many other countries promoted the ideal of “one internet, one global community, and a common body of knowledge that benefits and unites us all,” as Secretary of State Hillary Clinton put it in her landmark 2010 Internet freedom speech. The Obama administration’s 2011 International Strategy for Cyberspace warned that “the alternative to global openness and interoperability is a fragmented Internet, where large swaths of the world’s population would be denied access to sophisticated applications and rich content because of a few nations’ political interests.”

A permanent technological divide is unlikely, costly, and impractical.

Until recently, other Quad countries shared the same enthusiasm for this techno-globalist view. Australia’s 2017 international strategy for cyber-engagement is thick with references to a global community, global rule making, and a global online marketplace. Cybersecurity strategies issued by India and Japan in 2013 likewise spoke approvingly of a worldwide Internet community. These governments, in words if not always in deeds, advocated for an open and global technology environment as opposed to the more fenced-off and draconian corners of the Internet in China, Russia, and elsewhere.

A global Internet, however, need not be an ungoverned one. Countries that advanced a techno-globalist vision of the Internet and decried the “cyber-sovereignty” claims of authoritarians still exercised sovereign powers of their own, for instance in restricting child pornography. Some governments in Europe have instituted strong limits on hate speech, such as Germany’s Network Enforcement Act, which requires the swift deletion of illegal speech online. Still, until recently, these countries’ strategies took openness to the world as a starting point and sought to protect against a limited number of specific risks.

The liberal principles of openness, universal human rights, and fair market access still appear in current diplomatic initiatives, such as in the Quad’s statement of principles regarding technology or at the EU-U.S. Trade and Technology Council launched in September. But this rhetoric does not negate a tilt away from techno-globalism. The United States and its allies are increasingly aware of new vulnerabilities emanating from their connections to the world. The Internet’s dangers—such as the potential for cyberattacks and the dissemination of disinformation on a vast scale—have become clearer, inspiring a nationalist turn in several key democratic countries.

RISING BARRIERS

The democratic countries where techno-globalists were once unrestrained in their advocacy of an open Internet now have become preoccupied with technology’s risks. The Internet has allowed hostile state and nonstate actors to traverse borders. Criminal groups have launched ransomware attacks that paralyzed transnational shipping companies and wreaked havoc on global trade. Systemic problems in the digital device market have led to basic security vulnerabilities in everything from connected thermostats to industrial control systems used by power and water utilities. From elections to vaccines, disinformation presents acute domestic and global challenges.

As a result, leaders in India, the United States, and other erstwhile champions of a global Internet have in the last four years sought to impose more control over networks. Mirroring the actions of authoritarian governments, they seek to sever operational and supply chain ties, especially with China and especially in Internet sectors. The perceived threat of infiltration or sabotage is no longer confined to critical infrastructure vendors such as the Chinese firm Huawei but radiates now from other areas, such as social media and the consumer drone industry.

The Internet’s dangers have inspired a nationalist turn in key democratic countries.

Amid this shift, official rhetoric has dropped the “global” in speaking of technology and the Internet. The Trump administration’s 2018 National Cyber Strategy aspired to “promote an open, interoperable, reliable, and secure Internet”—but not necessarily a global one. Secretary of State Mike Pompeo’s Clean Network initiative called for expelling “untrusted” Chinese applications from U.S. app stores and keeping U.S. data away from Chinese-run cloud systems. The government of Narendra Modi, India’s nationalist prime minister, recently upheld its 2020 ban on dozens of Chinese software applications.

Distrust of the global Internet goes beyond nationalist politicians. A wide range of cybersecurity, data governance, and industrial policy experts identify integration between the United States and China in hardware supply chains and online services as a risk to national security. Questions around the integrity of the 2016 U.S. presidential election sparked broad fears that the Internet could undermine democratic institutions. Many thinkers who recoiled at the Trump administration’s caustic style—for instance, the president’s crude insistence on terms such as the “Wuhan virus” for the novel coronavirus—nevertheless believe China represents a model of digital authoritarianism that must be confronted, or at least isolated. In this darkening light, the global Internet can appear like a naive dream of years past.

Today, many democracies are making **messy efforts** to build consensus around countering China and other countries identified with digital authoritarianism. The British-led **D-10**, for example, seeks alternatives to China’s telecommunications firm Huawei in the rollout of 5G technology. In December, the White House will hold a “Summit for Democracy,” which advocates hope will advance a multilateral democratic counterweight to authoritarian technological practices. These efforts are not without merit, but they represent a **defensive** and **reactive** response to a **deeper** problem. At best, these initiatives might allow like-minded countries to regroup and find common ground before turning to face global challenges; just as likely, they could prove to be simply **diplomatic busywork** as **stubborn disagreements** persist among democratic governments and interest groups.

SALVAGING THE GLOBAL

A better approach would recognize from the outset that the Internet and the development of technology are invariably global and cannot be easily fractured between competing political blocs. Dividing the Internet at the infrastructure level into two or more independent networks would mean duplicating entire highly complex supply chains, which would be extremely costly, carbon-inefficient, and impractical, if even possible in the first place. Such fissures would also not prevent innovations or indeed threats—including malicious attacks and natural disasters—from crossing political divides.

A stark technological divide is not just unrealistic but also undesirable. Embracing a trend toward politically delineated technological ecosystems will undermine the open ethos that fuels and benefits freer societies—and bolster the top-down, controlling ethos favored by repressive regimes. And if rivals are less interdependent, they have less incentive to refrain from crippling attacks on each other’s critical infrastructures.

A stark technological divide is not just unrealistic but also undesirable.

Only a renewed and pragmatic embrace of techno-globalism will offer comprehensive solutions to the real problems of technological governance. Policymakers must adopt a global vision that avoids the folly of believing that technical systems and industrial supply chains can be totally walled off from countries such as China. They should develop solutions that recognize the value and inevitability of international connection. Moreover, as home to many of the companies and individuals that most influence the experience of the Internet around the world, the United States has a special role it cannot ignore. Firms such as Google and Facebook shape how rights to privacy and free expression are protected—or abused—and their motivations cannot be assumed to be virtuous, nor their stewardship of online communities ethical, simply because they reside in the United States. Cyber-utopians once dreamed of liberation spreading from an Ethernet cable; now Washington must ensure that its companies don’t spread exploitation and insecurity instead.

Responsible techno-globalism starts at home. The U.S. Congress must pass a comprehensive federal data privacy law to protect Americans from the overreach of technology companies and to demonstrate a commitment to democratic governance in the Internet age. U.S. thinkers and policymakers should take a global view in analyzing the human rights and security implications of surveillance technology produced in both democratic and authoritarian contexts. Officials must seek ways to enjoy the maximum benefits of open scientific exchange and cooperation while protecting important national security interests, for instance by narrowly targeting security-related areas for special scrutiny but actively reaffirming openness in other fields, including for students and researchers with connections to countries of concern such as China.

This urgent domestic work can form a platform for positive international efforts. With a new State Department bureau dedicated to cybersecurity and digital policy issues, the U.S. government should consult and cooperate with other democracies that are experiencing technology-related challenges and social eruptions. It may not always be easy to find consensus. The United States and the European Union, for instance, have long been at loggerheads over data governance, despite their many shared interests and values. But efforts to piece together an international, democratic, rights-respecting coalition on technology governance will fail before they get off the ground if they do not acknowledge—in assessing the challenges and shaping the solutions—that such a project is inherently a global one.

**Cyber ADV CP---Do Both**

**Do both. Cooperation with NATO solves.**

**Cohen** and Fontaine **20** [Jared Cohen, former member of the U.S. State Department’s Policy Planning Staff. He currently serves as CEO of Jigsaw and is an Adjunct Senior Fellow at the Council on Foreign Relations; Richard Fontaine, CEO of the Center for a New American Security. He has worked at the U.S. Department of State, on the National Security Council, and as a foreign policy adviser to U.S. Senator John McCain; 11-2020; "Uniting the Techno-Democracies"; Foreign Affairs; https://www.foreignaffairs.com/articles/united-states/2020-10-13/uniting-techno-democracies; KL]

The government leaders or ministers who meet as the T-12 would also have a **unique opportunity** to enlist the private sector and **international organizations** in their work. Annual meetings could serve as an arena for business leaders to join government officials in coordinating responses to emerging issues such as the need to improve remote-learning technology in response to the COVID-19 pandemic and what the future of counterterrorism might look like. The format for these meetings could include issue-based sessions, in which governments invite leading private-sector figures for focused discussions, or standing forums akin to the Asia-Pacific Economic Cooperation’s Business Advisory Council, which provides advice to Pacific Rim leaders on concerns facing businesses throughout the region. The T-12 could also develop working groups and committees on the multistakeholder model, which brings together representatives from business, civil society, government, and research institutions. These groups would then pass recommendations up to ministers and principals. Simultaneously, leaders could collaborate with other **multilateral organizations**—working with **NATO** on **AI security**, for instance, or with the Organization for Economic Cooperation and Development on the industrial implications of disruptive technologies.

**DA---Russia**

**Alliances don’t embolden allies.**

JMEs = joint military exercises

**Kuo** and Blankenship **21** [Raymond Kuo, political scientist at the RAND Corporation. He is an expert in international security, international order, and East Asia. Kuo was a tenure-track professor at Fordham University and the University at Albany, SUNY. He previously worked for the United Nations, the National Democratic Institute, and the Democratic Progressive Party (Taiwan). He holds a Ph.D. in politics from Princeton University Brian; Dylan Blankenship, Associate Director for North India and International Relations for the Initiative for Sustainable Energy Policy (ISEP). His work for the initiative covers areas that include energy policy, energy access, and the geopolitics of energy. He is co-leading ISEP’s work in Jharkhand, India, and is launching ISEP’s international relations research program. His current interests include the geopolitics of the renewable energy transition, as well as the political determinants and consequences of China’s overseas investments under the Belt and Road Initiative. Brian is an Assistant Professor of Political Science at the University of Miami. He received his Ph.D. in Political Science from Columbia University in 2018; 7-25-2021; "Deterrence and Restraint: Do Joint Military Exercises Escalate Conflict?"; *Journal of Conflict Resolution* 1-29; https://journals.sagepub.com/doi/abs/10.1177/00220027211023147?journalCode=jcrb; KL]

Abstract

Multinational military exercises are among the most notable demonstrations of military cooperation and intent. On average, one is initiated **every 8.9 days**. But it has often been argued that joint military exercises (JMEs) increase the risk of war. Using a relational contracting approach, we claim that **formal military alliances** mediate the effect of JMEs. Exercises and alliances serve **complementary functions**: The former allows **targeted responses** to military provocations by adversaries, while the latter provides **institutional constraints** on partners and establishes a partnership’s overall **strategic limitations**. In combination, alliances **dampen** the conflict escalation effects of exercises, **deterring** adversaries while simultaneously **restraining partners**. We test this theory using a two-stage model on directed dyadic data of JMEs from 19**73** through 20**03**. We find that JMEs in general do not escalate conflict, and that JMEs conducted with allies **in particular** reduce the probability of conflict escalation.