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Potential Security Implications of Climate Intervention Technologies for NATO

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As the global climate crisis worsens, the North Atlantic Treaty Organization (NATO) must face the new security threats that it poses. The effects of climate change will cascade from lower to higher order threats, affecting NATO and its member states and presenting both concerns and opportunities for the alliance. This paper discusses the security effects of climate change, the pros and cons of different types of climate intervention (CI) that would operate in the global commons and the policy implications for NATO, namely that deployment of CI would require military assets potentially leading to its militarization, and that the crisis has fundamentally destabilized our ideas of international security governance. Finally, there are three policy questions the alliance must answer to adequately govern CI.

INTRODUCTION TO NATO

It is not an exaggeration to say that NATO is the most successful defensive alliance in the modern world. Formed in 1949, the 12 founding members signed the North Atlantic Treaty to counter the expansion of Soviet influence across Europe.¹ Resting on the international relations principle of collective security, the pointy end of the Treaty is Article 5, which states, “The Parties agree that an armed attack against one or more of them . . . shall be considered an attack against them all . . .” and that the Parties would take “such action as it deems necessary, including the use of armed force” in order to restore and maintain security.² These security guarantees, however, are not unbounded; the text of Article 6 geographically limits the scope of these actions to Europe and the North Atlantic.³

The Soviet Union countered the formation of NATO with its own defensive alliance, the Warsaw Pact, in 1955, and the resulting Cold War amounted to a 40-year nuclear standoff.⁴ Following the collapse of the Soviet Union and the subsequent rejection of communism by Eastern European states, the Warsaw Pact was disbanded in 1991. While its original twentieth-century threat is now gone, NATO is still tasked with the protection and defence of its member states, which means facing twenty-first-century security threats. However, neither the agreed-upon definition of “armed attack” nor the geographic limitations of Article 5 allow NATO to fully grapple with the security implications of climate change.

CLIMATE SECURITY THREATS

IPCC Climate Change Findings

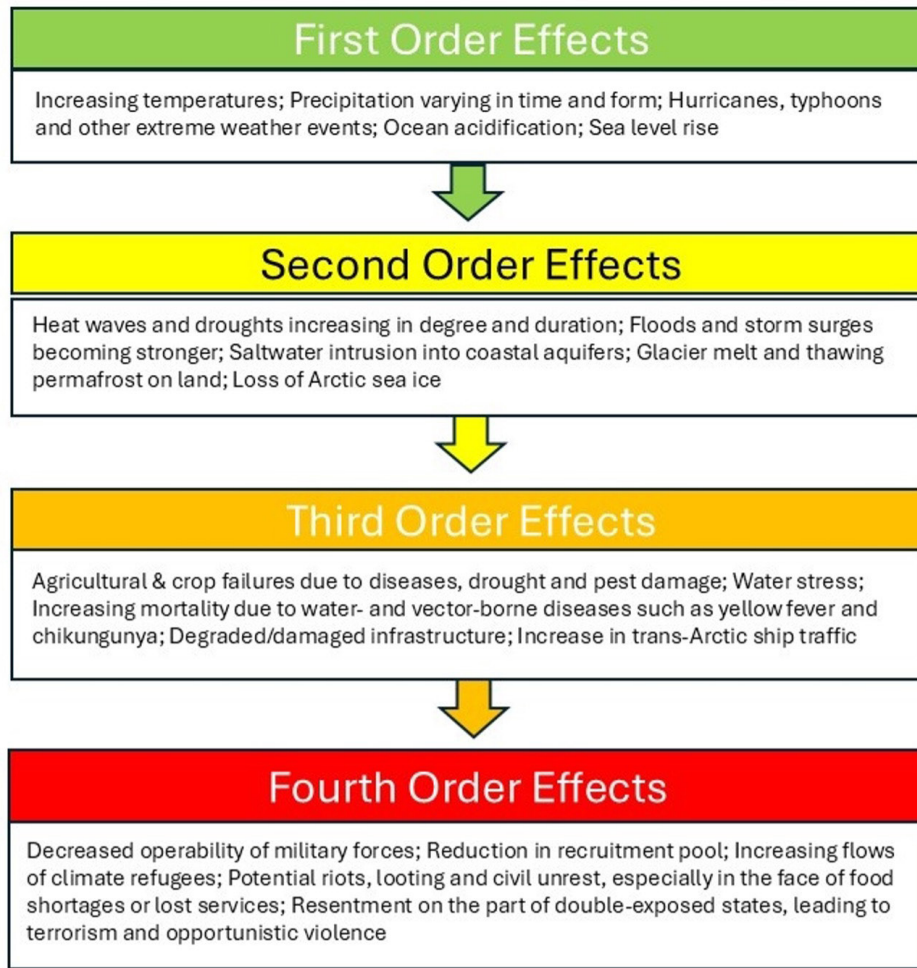
Climate change, also known as anthropogenic global warming (AGW), refers to the alteration of the earth’s energy balance by means of increased greenhouse gas concentrations in the atmosphere. The UN Framework Convention on Climate Change defines it specifically as: “a change of climate attributed directly or indirectly to human activity that alters the global atmosphere’s composition, which is in addition to natural climate variability observed over comparable time periods.”⁵ The Intergovernmental Panel on Climate Change (IPCC) has released six assessment reports to date, and publication of the seventh assessment report is scheduled for 2027-2028. The report findings are clear: “Human activities, principally through emissions of greenhouse gases, have unequivocally caused global warming . . . [g]lobal surface temperature has increased faster since 1970 than in any other 50-year period over at least the last 2000 years.”⁶ The UN Secretary-General António Guterres has called this finding “a code red for humanity.”⁷

Cascading Effects

The first order effects arising directly from AGW are: increasing temperatures; fluctuating precipitation types, levels and timing; increasing extreme weather events; and increasing sea levels.⁸ Higher order effects cascade from these primary environmental changes, such as a loss of precipitation leading to drought, potentially leading to agricultural failure, leading to food insecurity, which leads to requests for food aid.

Figure 1 illustrates additional examples of climate security cascade effects, although not all the potential effects are represented here.

Figure 1: Cascading Effects from Climate Change



Source: Author

NATO Concerns and Opportunities

Signs of increasing climate change and variability are all around us. As these effects cascade, NATO must respond to the strategic vulnerabilities it brings but also recognize the opportunity to position and equip its forces for the twenty-first-century operating environment.

As training and combat conditions change, NATO member states' armed forces must upgrade and/or harden their military infrastructure to operate under extreme heat or cold, rising sea levels and rougher weather events.⁹ They could face new health and infectious disease profiles in places to which they are deployed; this means new training and medical profiles for troops, as well as a potentially decreased

recruitment pool. They also might undertake new missions, as the potential for requests increases from civil authorities facing climate refugees or civil unrest due to third-order effects such as food shortages or water stress.

The effects of AGW on the alliance are not, however, all negative. Through joint planning, forward-looking member states have an opportunity to make significant climate mitigation and adaptation gains across the diplomatic, military and scientific domains. Interoperability is a major concern, and changing environmental conditions provide an impetus to standardize material and procedures.¹⁰ Increased ship traffic across a melting Arctic will require NATO to improve its ability to interdict Russian ships, if necessary, which is a potential long-term benefit. Industrial and trade agreements to lower carbon output among member states can strengthen alliances both within NATO itself and with outside security agreements and organizations such as ANZUS (Australia, New Zealand and United States Treaty) and the Association of Southeast Asian Nations (known as ASEAN), thus earning international goodwill.

CLIMATE INTERVENTION

In addition, both NATO members and potential rival states alike are now taking a new set of responses into consideration to combat the effects of AGW: climate intervention technologies, more commonly known as geoengineering.

Two Different Types of Geoengineering: SRM and CDR

The terms “geoengineering” or CI are umbrella terms that cover a large range of technologies and potential technologies, all with different costs, geographical scales and lengths of time to achieve effectiveness. The technologies for solar radiation management (SRM) are designed to reflect sunlight away from the planetary surface, through means such as stratospheric aerosol injection (SAI), cloud brightening, reflective surfaces or even space-based methods.¹¹ Carbon dioxide removal (CDR) technologies are designed to remove CO₂ and other greenhouse gases from the atmosphere directly through methods such as reforestation, ocean iron fertilization (OIF), biomass carbon removal and direct air capture.¹² CI has been presented as “a novel source of geopolitical influence through influencing global climate systems,” but this influence is embedded in existing assumptions about our international security competition.¹³

Within NATO’s framework of security, there are three main CI technologies of concern. SAI is a technology by which fine aerosol particles of sulfur dioxide (or other particulates) are spread into the upper atmosphere to scatter incoming sunlight from reaching the earth’s surface, much the same way a volcanic eruption does. Marine cloud brightening (MCB) would use aerosolized seawater to encourage the formation of reflective marine clouds. While SAI and MCB would work relatively quickly to stabilize global temperature, once deployed, they must be maintained in order to avoid termination shock. OIF

would reduce atmospheric carbon dioxide biologically by stimulating plankton growth, which take in carbon and sequester it.¹⁴

Development of these three types of CI, which are deployed from the global commons (atmosphere or high seas), is currently bankrolled by states, universities, foundations and private individuals, totalling US\$216.7 million by the end of 2024.¹⁵

SECURITY IMPLICATIONS OF CI FOR NATO

Why should NATO be concerned with CI from an alliance perspective? First, and perhaps least significant, all three types of CI described above may very well require military assets for deployment and logistics. If CI is considered a “weapon” with which to combat the national security threat multiplier of climate change, then the responsibility to protect a country falls upon its government and not on private actors. This ongoing military engagement (because CI is not a one-and-done response) could result in an escalation in military budgets as new equipment and/or expertise may be needed to initiate and maintain these operations. This could also result in the increased potential for securitization of the climate space, as decisions of whether and how to deploy CI are made through a military lens.¹⁶

This also raises the potential for undesirable secrecy and suspicion in policymaking, as new technological advances in CI may be classified if they are deemed to provide a significant strategic advantage. Conversely, governments may face a “Janus dichotomy” with regard to CI policy if their populations oppose CI on grounds of principle or partisanship by making public statements against CI while pursuing it privately.¹⁷ Either condition erodes public trust in the technology and in government truth-telling, leaving the discussion of CI open to mis/disinformation and conspiracy theories.¹⁸

Second, and more significantly for NATO directly, it is unclear if the use of CI could warrant triggering Article 5 of the Treaty, which refers to “armed attack.” When the North Atlantic Treaty was written, armed attack meant traditional kinetic weapons wielded by military forces. Now, however, the world has progressed well beyond traditional weapons as a means of conducting hostilities (for example, cyberattacks). While the Environmental Modification Convention of 1977 (ENMOD) specifies that non-hostile use of environmental modification techniques is not forbidden by its terms, two possibilities arise. First, a state that suffers negative consequences from CI use by another state could view it as hostile, leading to inter-state arguments about intent, although this would be notoriously difficult to prove. Second, a state may actually have a hostile intent toward a rival state and choose to deploy CI to degrade its environment. Some scholars argue that CI is not territorially specific enough to accomplish this without the deploying state also feeling those effects; however, if their economy and environment are robust enough, this might be a price they are willing to pay.

Finally, the entire system of international relations that holds organizations such as NATO together and gives them their legitimacy is built on the concept of territorial sovereignty; however, both climate

change and the potential for CI are exposing the increasing irrelevance of that concept. Cross-border flows of cyberattacks, digital finance, refugees and viruses presently undermine the capacity of sovereign states to maintain territorial exclusion when addressing transnational challenges. Now the security effects of climate change and the potential to use CI to combat them, will finally drive a stake through the fundamental assumptions of this 400-year-old idea of what powers states truly possess.¹⁹

Climate change caused by greenhouse gas emissions in one country has already pushed threatening environmental conditions such as heat waves and intense storms across borders and into countries on the other side of the world, although it is important to note that these emissions are not targeted with hostile intent, but are merely an externality of normal economic development. CI technologies, however, if and when deployed, now have the potential to materially change the living conditions of other states with intent as a means of hybrid conflict or environmental grey-zone warfare. Because the effects of these technologies diffuse over the entire planet, no distinction can be made at that scale between those who benefit from this intervention and those who do not.²⁰ The United States and other countries have attempted weather warfare before,²¹ and while the “hostile” use of climate-altering technologies is prohibited by ENMOD, not all states are party to ENMOD, nor would parties even necessarily abide by its conditions if the ancillary negative effects on a rival state were sufficiently attractive.

How might these planet-changing technologies be governed? Domestic laws cover land-based methods of CI such as enhanced weathering and afforestation, but those that require access to the global commons would, in theory, be governed by international law, whether by a formal blackletter treaty or convention, or by customary principles of general practice. However, current international law provides inadequate guidance on how to govern CI; neither global environmental treaties such as the Long-Range Transboundary Air Pollution Convention or the London Dumping Convention, nor the laws of war such as Geneva Protocol I or ENMOD address the potential for individual states or alliances of states to alter the planetary atmosphere at scale.²² This legal limbo of permissibility opens up the possibility for CI to be used as hybrid or grey-zone warfare, and pins no blame for any resulting collateral environmental damage on anyone.

CONCLUSION AND POLICY SUGGESTIONS

As NATO plans for security in a globally warmed world, the alliance will have to consider what steps it could and should take to address the security opportunities and threats that CI poses.²³ In order to do this, three questions need to be answered.

First, how can the alliance formulate a unified position on CI? NATO should immediately convene a scientific/political/ethics exploratory committee to map out potential political and environmental paths forward. The NATO Science and Technology Organization can set up a ninth Scientific and Technical Committee with an area of work focusing on emerging CI technologies, and commission further research on:²⁴

- The likelihood CI will be necessary
- CI's benefits and risks as a security mechanism, and the potential for counter-CI attempts²⁵
- How to measure and address collateral environmental damage
- The possibility of CI's use as a method of grey-zone warfare²⁶

This committee should draw on government personnel, military experts, scientists and academics across disciplines to ensure a diversity of perspectives both inside and outside of NATO. This fits neatly within NATO's strategic foresight methodology of "building adaptive capacity to accommodate multiple potential futures across an increasingly complex security environment where military and civilian spheres are increasingly blurred."²⁷

Second, what type of CI governance regime would best suit the needs not only of NATO, but its member states? Given that any effects of deployed CI may have economic, environmental and security ramifications for the entire planet, NATO must be very aware of the potential for misattribution and accusations of hostile intent to follow any such deployment. Fortunately, a previous multilateral security proposal might be able to be used as a governance template.

In 1946, the newly established United Nations grappled with the reality of atomic weapons and the unprecedented security challenges they posed: they were powerful technology; there could be no defence against them; and secrecy around their production was rapidly decreasing. The United States proposed the Baruch Plan to build an international authority that would govern all development and use of "nucleonics" (what they called atomic science at that time) to avoid a highly destructive arms race. CI now meets some of those same conditions - planet-changing technology, no defence, no secrecy. There is one significant difference, however, when applying the arms control template to CI: the norms of international cooperation and technological oversight contained in the Baruch Plan were *prohibitive* norms — things that must *not* be done, such as use atomic weapons like regular arms, so that a nuclear war might be avoided. However, climate change will happen, so any norms of international control over CI must be *prescriptive* norms — things that *must* be done to prevent a climate arms race of ungoverned CI on top of the ecological catastrophe of unchecked global warming. Negotiating prescriptive norms is difficult, so states that wish to negotiate an arms-control type of agreement to govern CI should begin with a mini-lateral convention and invite others to accede. The time for developing proactive governance frameworks is now.

Third, will the field of international relations need to change some of its foundational ideas and concepts as a result of CI development? International relations, like many academic fields, clings to old ideas. With the advent of twenty-first-century threats, however, NATO should recognize that the assumption of sovereignty of individual state territories can no longer be supported environmentally.

Every state is connected to every other state ecologically through air and water, biota, atmosphere and ecosystem resilience (for example, protection from the spread of diseases); in addition, in a globalized world states are linked through trade and travel, financial systems and the internet. However, security is still conceived of largely in terms of territorial integrity and military superiority. How can international relations be redefined in an era where the boundaries of the state are no longer its own borders? Robert O. Keohane and Joseph S. Nye Jr.'s concept of "complex interdependence" forced scholars and statesmen to reimagine international relations away from the Westphalian model of realism toward the gains that can be made from countries preferring peace and economic development over war and conquest.²⁸ But now, even complex interdependence does not paint a comprehensive picture of the twenty-first-century security landscape. Climate change is eroding our traditional definitions of safety and security; therefore, NATO must come out ahead of the governance lacuna and plan for CI deployment and the potential benefits and risks it poses.

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