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Reflecting on the Original Silk Road Renaissance

The Genius Legacy of Ibn Sina and Biruni
S. Frederick Starr

Perspectives on Climate Change and the Environment: Preparing for COP29

The Battle for Green Supremacy
Carlos Roa & Shubham Dwivedi

Carbons of War
Jahangir E. Arasli

Two New Concepts of Power and Influence

Free and Open Spaces
James Jay Carafano & Márton Ugrósdy

Pivotal States, Not Swing States
Mohammed Soliman

Regional Geopolitical Assessments

Russia, China, and the Western World
Klaus Larres & Lea Thome

The South Caucasus and Great Power Confrontation
Gulshan Pashayeva

Georgia: Open-Door Country
Maxime Gauin

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Carbons of War

The Environmental Impact of Military Activity in Conflict and Peace

Jahangir E. Arasli

"The environment is always a casualty of war. Always. When the guns fall silent, people are left to shoulder the burden of a toxic legacy for generations"

— Inger Anderson, UNEP Executive Director, 6 November 2023

Climate change is the supreme challenge of our times, poised for human civilization. Its facets are diverse: the rise of temperatures, trending natural disasters and enduring weather extremes, droughts and floods, fluctuations of the sea level and hydrographic regimes, distressed ecosystem balances, and other aberrations. Climate change affects human health and demography, increases food and water insecurity, accelerates environmental degradation (such as deterioration of arable and grazing lands, deforestation, or desertification), shrinks biodiversity, and produces other similar effects. Climate change escalates competition for dwindling resources and, subsequently, generates frictions and tensions between states and within individual groups of populations, thus forming a stage for geopolitical and geoeconomic rivalry as well as potential violent conflicts and wars. The snowballing impact of climate change on a global scale steadily approaches the point of irreversibility.

The grim irony is that climate change, in many ways, represents a result of different forms of anthropogenic activity, including increased carbon emissions.

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Although the climatic transformation is already acknowledged as the ultimate challenge of global magnitude, one particular aspect remains often overlooked. Warfare is one of the countless varieties of human performance. Wars and armed conflicts naturally yield an enormous impact on the anthroposphere and habitat. Beyond that, the existing military forces and their routine activities unwillingly affect the environment even in peacetime.

Therefore, this essay examines different patterns related to the damaging impact of wars and military activities on the climate and the environment, with a particular focus on carbon emissions. Furthermore, it addresses the subject of climate change-driven conflicts and evaluates measures taken at the international and national level to mitigate the effects projected by military forces on the environment. The overall objective of this paper is to provide analytical support in the course of preparations for the 2024 United Nations Climate Change Conference (COP29) in Azerbaijan.

This essay examines different patterns related to the damaging impact of wars and military activities on the climate and the environment, with a particular focus on carbon emissions.

From Pre-Industrial Wars to Nukes

Since ancient times, wars have always led to the devastation of the environment. Appropriate examples are found in various holy books and numerous historical chronicles that refer to the "scorched earth" approach to warfare as a ravaging military tactic. The deliberate or unintended collateral damage of this approach to war-making became increasingly amplified with the advent of the industrial age, the development of technologies, and the globalization of conflict cycles. World War I introduced high explosives and motor warfare; more than a century after its end, there are the "red zones" remaining in northwest France, where people still cannot live or implement economic activity.

World War II witnessed the extensive application of airpower and firepower. As a result, myriad particles from the debris of ruined cities and towns went up into the atmosphere, together with carbon

dioxide produced by fires. Besides, motors and engines of military hardware added the mammoth volumes of that gas. The final accord of that war, in the form of the mushroom clouds over Hiroshima and Nagasaki, manifested the beginning of the nuclear era.

The devastation caused by World War II compelled the postwar international community to consider measures for codifying and limiting the impact of war on the environment. The clauses of the 1949 Geneva Convention and its additional protocols envisage a responsibility of the warring parties for the protection of the environment during armed conflicts. However, the zero-sum game logic of the Cold War and the deployment of massive armed forces by two opposing coalitions increasingly affected the environment, notwithstanding the absence of direct military confrontation.

The First Gulf War provided a clear illustration of how military operational logic negates the environmental impact, which is seen as inevitable collateral damage.

Nuclear weapons introduced a new hazardous dimension. Over 2,000 nuclear detonations in 1945-1992 conducted by the United States, the Soviet Union, the UK, France, and China contaminated the soil, air, and ocean waters at test sites in places like Nevada, the Marshall Islands atolls, the Novaya Zemlya archipelago in the Arctic, French Polynesia, China's Xinjiang, and other parts of the globe. Furthermore, several incidents and catastrophes involving nuclear weapons took place. In the U.S. only, there were 32 nuclear-related incidents (the code name "Broken Arrow"); six nukes are still unaccounted for. Nine sunken nuclear-powered submarines (two American and seven Soviet or Russian) lie in the ocean bed with their reactors not recovered; one of them (the Soviet K-219), which sank in 1986 not far from the U.S. East Coast, had 16 ballistic missiles with nuclear warheads onboard.

The conventional warfare of the Cold War period also produced environmental impacts. During its long war in Indochina, the U.S. and its allies dropped over 7.5 million tons of aerial ordnance—double the amount released by all belligerents during the entirety of World War II. The application of firepower and the use of both napalm and herbicide defoliants further amplified the collateral damage to the environment.

During the Cold War, thousands of square kilometers of valuable land (especially in Central Europe) were alienated for military disposal to accommodate bases, firing ranges, training grounds, and storage facilities. That period left a legacy in the form of contamination, radiation, and pollution that continues to affect soil, air, water, and aquifers. The need for the utilization of surplus weapons, equipment, and ammunition stocks placed another burden on the post-Cold War states, as is explained below.

The war in Ukraine provides a prime example of how a contemporary war contributes to mounting global environmental degradation.

The first post-Cold War era conflict—Operation "Desert Storm," which ended the illegal Iraqi occupation of Kuwait in 1991—displayed a grandiose consumption of ammunition. In addition, the retreating Iraqi troops set ablaze hundreds of oil wells out of revenge and in order to obscure the U.S.-led coalition forces' targeting with a smokescreen. According to some published accounts, the 43 days of fighting resulted in the emission of 133 million tons of carbon dioxide into the atmosphere.

In addition, the Iraqis released many thousands of tons of crude oil into the Persian Gulf to deter a potential amphibious landing of the U.S.-led coalition forces. The latter, in turn, extensively used tank cannon shells with depleted uranium (DU) rods with higher armor-piercing capacity (something similar took place in 1999 during the NATO bombing campaign of Yugoslavia). That war provided a clear illustration of how military operational logic negates the environmental impact, which is seen as inevitable collateral damage.

Technology and Recklessness

At the current stage, ongoing wars and armed conflicts continue to contribute to the mounting global environmental degradation. The war in Ukraine provides a prime example of such an impact. This war is distinguished by an enormous ammunition consumption rate (artillery shells, rockets, bombs, and missiles), whose detonation generates

carbon dioxide emissions. The open burning of destroyed buildings and military hardware, movements of troops and engine-powered equipment, logistic sustainment operations, and aviation activity (especially jets, which are conducting hundreds of sorties daily) add more releases.

According to some accounts, 120 million tons of greenhouse gas (GHG) emissions were released into the air in the first year of conflict only; that amount is equal to the combined yearly GHG output of Singapore, Switzerland, and Syria (it should be noted, though, that it is hard to independently verify the methodology of this research). In addition to CO2, explosions and fires release harmful chemical particles, such as methane, hydrogen cyanide, silica, benzene, nitrogen dioxide, and other ingredients, which cause the exposure of combatants and civilians in the war zone and beyond.

The fighting reduced many areas to what looks like a lunar landscape and produced hundreds of thousands of tons of rubble and debris. Landmines and unexploded ordnance (UXO) infest the more than 1,000 kilometer-long frontline and the adjacent areas. An illustrative example: a single salvo of a Smerch multiple launch rocket system (MLRS) in its cluster munition variation contains 12 artillery rockets, each fitted with up to 588 shaped fragmentation sub-munitions; thus, an MLRS battery consisting of four launchers can cover an area of almost 70 hectares with 31,008 (!) bomblets (the calculation is mine). As a statistical rule, 5 to 10 percent of the fired munitions do not detonate. The postwar demining and UXO disposal in that theater of operations will take one generation, at least.

The destruction of the dam on the Dnieper River in June 2023 (for which the adversaries are blaming each other) has led to a large-scale natural disaster. Over ten cubic kilometers of water released from the Kakhovka reservoir by the demolition of the dam caused flooding across an area of 600 square kilometers of the adjacent lands downstream. Consequently, the level of water in the reservoir decreased by 80 percent, thus affecting the water supply to the nearby region.

At the same time, over 80,000 hectares of the protected areas—including three natural reserves that served the habitats of various endemic species—became swamped. That catastrophe has also affected the sensitive ecosystem of the Black Sea. The indiscriminate targeting by the Russian military forces against critical infrastructure, such as the Dnipro hydroelectric power plant and high dam, and the military activities near the Zaporizhzhia and Chernobyl nuclear power stations (the former is in active mode, the latter is mothballed) threaten to instigate potential catastrophes of the same or even larger scale.

In total, almost 30 percent of the internationally-recognized territory of Ukraine is directly affected by the war, and the estimated damage to the environment is over $54 billion, as of the end of 2023. The restoration of the environmental balance in the aftermath of that war will take many decades, while urban rebuilding and reconstruction will require the release of more volumes of GHG.

The environmental effects of the war in Ukraine are widespread in areas beyond the direct theatre of operations. The mysterious sabotage of Nord Stream 1 and Nord Stream 2 seabed gas pipelines in September 2022 led to the outflow of quantities of natural gas into the Baltic Sea. In the Caspian Sea, the indirect impact of Russian military operations reportedly left thousands of seals dead, as malfunctioning aerial cruise missiles launched from over that area towards Ukraine fell into the seawater, contaminating it with leaked fuel. Intensive dredging in the Volga delta, port construction works, and increased shipping facilitating the strategic bridge between Russia and Iran further affect the already fragile and encapsulated Caspian ecosystem, which is already suffering from the decreasing sea level.

Moreover, Russia has contracted a "grey fleet" of aged oil tankers, which now sail the world's seas and oceans to facilitate the export of its sanctioned oil; the technical conditions of most of these vessels are below standards and may end in catastrophe eventually.

The Armenian military forces, during their occupation of parts of the territory of Azerbaijan (1992-2023), also actively practiced "scorched earth" tactics. These included, inter alia, the indiscriminate use of landmines, engineered earthworks, illegal geological mining, deforestation, abuse of water resources, and other environment-damaging practices.

After the liberation of the occupied territories in 2020-2023, Azerbaijan faces an enormous task of rebuilding and rehabilitation, including demining, unexploded ordnance disposal, and the restoration of damaged ecosystems.

The undertaking of managing the consequences of the three-decade-long ecocide will take decades and multibillion-dollar investments.

Violent non-state actors around the world—a category that by definition does not observe international law, rules, and ethical norms—also aggressively harm the environment during intrastate conflicts. Some governments are also contributing to it with the disproportional use of force: the Ethiopian army, during its 2023 counterinsurgency campaign, actively used "scorched earth" techniques in the rebellious region of Tigray, which had just started to recover from the ecological disaster caused by fighting in the previous decades.

According to the UN Environmental Program, no less than 40 percent of intra-state armed conflicts in the past 60 years were associated with the exploitation or abuse of natural resources (not incidentally, the UN General Assembly declared 6 November the International Day for Preventing the Exploitation of the Environment in War and Armed Conflict). A predatory abuse of those resources by all warring parties is a hallmark of multiple African wars: mined timber, ivory, and rhino horns sustain arms supplies.

Uncontrolled poaching heightened by fighting is distressing many African wildlife species in danger of extinction, such as gorillas. Poppy and coca leaf cultivation by armed groups in Myanmar, Afghanistan, and parts of South America violate natural balances in those areas, while the rapacious exploitation of oil wells by armed groups pollutes vast plots of the Syrian Desert.

A very illustrative example of how a violent non-state party could cause a manmade disaster is the sinking of the merchant vessel *Rubymar*. In February 2024, that UK-owned and Belize-flagged vessel was hit by a missile launched by the Yemeni Houthi militants. It quickly sank in the Red Sea, leaving a 29-kilometer-long oil slick on the surface and 41,000 tons of chemical fertilizers in its cargo hold in the seabed. That incident endangered the unique ecosystem of the Red Sea, particularly its coral reefs.

The secondary impacts of wars and conflicts on the environment are also immense. Human displacement—an unavoidable product of most armed hostilities—also causes environmental stress in the areas where displaced people find refuge. Furthermore, post-conflict rebuilding, reconstruction, and rehabilitation activities upsurge the carbon trail too.

According to think tank guesstimates, the U.S. war-related military operations in 2001-2018 produced 440 million metric tons of carbon dioxide equivalent (CO2 equivalent, or CO2e), of the total amount of 1,267 million CO2e left by the U.S. military in that period. The first two months of the 2023-2024 middle-intensity war in Gaza caused by the Hamas terrorist attack against Israel led to the emission of 281,000 metric tons of CO2e. It is important to note, though, that those accounts are constructed on theoretical models that cannot be verified independently and could be politically biased. However, the mere fact that wars critically harm the environment and contribute to carbon dioxide emissions is undeniable.

Climate change expands windows of vulnerability by worsening existing geopolitical frictions, tensions, and conflicts while bringing new ones into being.

In the War Loop

There is an evident nexus between climate change and the likelihood of armed conflicts. Although getting into the details of this aspect is beyond the scope of this essay, it is possible to briefly outline its key points.

Climate change expands windows of vulnerability by worsening existing geopolitical frictions, tensions, and conflicts while bringing new ones into being. The ice melt in the Arctic illustrates how new climate change-related realities are materializing. Along with the emerging geoeconomic and connectivity opportunities, that thaw phenomenon is instigating geopolitical competition in that region between the Western powers, Russia, China, and other states. Mineral and biological resources combined with assuming control over the shipping lines are at stake. One of the particular outcomes of that now heightened competition is a remarkable increase in military activity in the Arctic, which produces additional stress on the region's environment—one of the few places on Earth not too touched by human enterprise.

Meanwhile, in the African regions of the Sahel, Darfur, and the Horn of Africa, climate change and higher temperatures produce water scarcity, which in turn reduces opportunities for agriculture and cattle breeding and aggravates the competition

for shrinking resources between different population groups.

Water and food insecurity are among the principal causal factors contributing to the occurrence of civil wars and the spread of terrorism. The ensuing displacement and migration of populations cause pressure on resources in other places where refugees go, arrest economic growth, and produce social instability, thus making the initial consequences further widen. One of the underlying causes behind the start of the ongoing civil war in Syria that began in 2011 was that it was preceded by a two-year-long period of drought and bad harvests. This led to an internal migration of rural populations to cities where jobs and housing were scarce, inadequate, or too far out of reach. The result was a critical explosive mass that could not be controlled.

In addition to intrastate conflicts, environment-related encounters produce interstate tensions too. The Middle East is particularly vulnerable. As the late King Hussein of Jordan once explicitly warned, "Water is the one issue that could drive the nations of this region to war."

Taken together, the militaries of the world are the fourth-largest GHG emitter on a global scale, behind only the United States, China, and India.

Since the late 1980s, the Turkish construction projects of 22 high dams on the Tigris and Euphrates rivers have continued to generate controversy between Türkiye and downstream-placed Syria and Iraq. Likewise, Egypt and Sudan have protested and even threatened to use force against Ethiopia to prevent the construction of the Grand Ethiopian Renaissance Dam on the Blue Nile, a tributary of the Nile River. This project would benefit Ethiopia but deprive Egypt and Sudan of much of the water used for agricultural, industrial, and public needs.

All of the abovementioned cases clearly illustrate both an intersection and a causal chain between climate, conflicts, and human (in) security.

Harmful Peacetime Military Routines

The planet's combined military forces produce 5.5 percent of global GHG emissions (2022 figures). This means that, taken together, the militaries of the world are the fourth-largest GHG emitter on a global scale, behind only the United States, China, and India. The nature of military activity (it operates 24/7), such as training and drills, live firing exercises, and equipment maintenance, means that this category of human conduct consumes sizeable volumes of fossil fuel and thus leaves a huge carbon footprint.

In addition, each military unit in its permanent station produces persistent pollutant precipitants and contaminating wastes (e.g., diesel, gasoline, oil lubricants, acid, unexploded ordnance, empty casings, depleted batteries), which also have negative environmental and ecological impacts.

Imagine a tank battalion of 40 or more vehicles that spends one day on a firing range. Beyond the amounts of CO2 returned from fires, explosions, and combusted jet or diesel fuel, the unit training also yielded toxic oxides and blast agents that go into the air. Training flights of military aircraft, especially jets, emit CO2 into the atmosphere's layers. The pinging of sonars used by naval warships affects marine mammals and often causes their beaching. In addition, military training, involving large numbers of forces, weapons, and equipment, often causes physical damage to geographic locations, lands, and ecosystems. The land used by the military worldwide occupies an estimated 1 to 6 percent of the Earth's surface.

The disposal of aging or surplus weapons, equipment, ammunition, and other military supplies represents a particular challenge. In the past, when climate change was not at the top of a nation's policy priority list, military leftover items were dealt with recklessly.

After the end of World War II, for example, over 1 million tons of conventional ammunition were dumped in the Atlantic Ocean between Scotland and Ireland, together with more than 110 former German submarines scuttled in the same area (Operation Deadlight, 1945-1946). Substantial quantities of chemical shells were discarded in the Baltic Sea in the same manner.

During the Cold War, the USSR manufactured over 50,000 main battle tanks (more than all the other countries in the world combined); many hundreds of them are still rusting away in open storage facilities in some post-Soviet states (e.g., Kazakhstan and Uzbekistan), waiting for disposal—something that requires an expensive and energy-consuming technological

process. Dozens of decommissioned Soviet / Russian submarines in the Arctic and the Pacific await the deactivation of their nuclear reactors for decades. According to the Bellona Environmental Foundation headquartered in Norway, the pending recovery of five scuttled submarines' nuclear reactors from the seafloor of the Kara Sea will cost €278 million.

The infamous saga of the *Sao Paulo* aircraft carrier offers a glimpse of the challenge related to the management of the disposal of military hardware. This particular ship was written off by the French navy and sold to Brazil. The Brazilian navy decided to decommission her after a quarter of a century, due to its poor technical condition and associated hazards: the ship's interior contained kilometers of cables covered by asbestos as well as mercury, lead, and other carcinogenic materials. The ship's hull was towed to Türkiye for scrapping and recycling; however, she was barred entry into Turkish territorial waters after local environmentalist groups protested. Then the ship had to return to Brazil, where she was also banned from port entry. Eventually, the navy scuttled this ship of misfortune—with all its toxic filling in the Atlantic Ocean at a depth of five kilometers—despite vocal protests from the country's public prosecutor's office, Greenpeace, and other environmentalist groups, which accused the Brazilian military of violating international conventions on the trans-boundary movement of hazardous wastes and prevention of marine pollution.

"Green Warriors"

In discussing the highly politicized subject matter of climate change, some politicians, scientists, and environmental activists have put the utmost responsibility for carbon emissions on the Global North. Indeed, from the perspective of the Global South, it was the countries of the Global North that had launched and then benefited from the Industrial Revolution and are responsible for 92 percent of surplus GHG output, to which military-related activities also contribute.

Western states were the first to initiate and implement measures, procedures, and reforms aimed at controlling and limiting the environmental impact of military activity in war and peace.

That said, it is also necessary to admit that Western states were the first to initiate and implement measures, procedures, and reforms aimed at controlling and limiting the environmental impact of military activity in war and peace. Those actions are developing along five pathways. Each will be examined in turn.

The first such pathway is the *adaptation of institutional culture and architecture to environmental agendas*. Environmental imperatives have led to changes in militaries' institutional domains. For instance, the United States established the Environmental Management Directorate under the Office of the U.S. Secretary of Defense. Its area of responsibility is to incorporate environmental concerns into the American military's activities, reduce environmental costs and impacts of military operations, and execute other related tasks. All U.S. uniformed services have specialized departments, such as the U.S. Army Environmental Command.

The majority of defense forces around the world, from France to South Africa, now have tons of manuals, guidebooks, and various types of "green codes of conduct" to regulate environmental and ecological aspects of military activities. A particular instance is the Environmental Guidebook for Military Operations, developed by a multinational working group and approved by the armed forces of the United States, Finland, and Sweden.

To increase environmental awareness among uniformed personnel, defense establishments conduct specialized training courses and embed designated officers (ombudspersons) to oversee environmental norms. Some armies (e.g., the Indian Army) have even established specialized ecological units or task forces.

The second pathway is *the projection of a responsible attitude*. Defense forces around the world now have to adopt policies and operational performance that minimize the environmental impact caused by military missions, notwithstanding their types.

One particular example of that track is the serial NATO exercise "Nordic Response," which is conducted biannually in Norway. In 2024, the Norwegian Armed Forces, implementing measures to reduce the risk of accidents or damage to property and the environment during that exercise, established a special Joint Daily Safety Signal publication to increase forces' and

public awareness on the subject matter.

Moreover, the breeding areas of sea mammals (e.g., whales, orcas, dolphins) are exempted as zones of naval exercises; the militaries of the U.S., Canada, Australia, New Zealand, and some European states have adopted codified procedures and caveats for the use of active sonars in order to ensure the protection of the marine mammals from acoustic disturbance. A striking example of the responsible modus operandi is provided by the case of the *USS Guardian*, a U.S. Navy minesweeper that accidentally ran aground on a reef off the coast of the Philippines—an area that had been previously designated as a national natural park. In order to avoid damage to that fragile ecosystem, the U.S. Navy was ordered to disassemble the ship on the spot of the accident instead of undertaking a salvaging operation. Formal apologies and compensation were provided as well. Thus, a valuable asset became stricken from the naval order of battle to preserve the environmental balance.

The third pathway aimed at controlling and limiting the physical impact of military activity in war and peace is the *application of environment protection missions and disaster relief operations.* Many national military forces around the world, as the most organized state agents, now train for consequence-management and resilience duties related to natural and man-made disasters producing environmental and ecological impact (e.g., floods, storms, bushfires, industrial and transportation catastrophes and incidents).

Often, such missions are transformed into complex multinational humanitarian relief operations that involve dozens of countries, as they did in the wake of the 2004 Indian Ocean earthquake and tsunami. Another example is how during the outbreak of foot-and-mouth disease in the UK in 2001, the British Army provided assistance to civilian powers to manage the consequences.

Moreover, military engineering units around the world are often engaged in water management and construction works aimed at minimizing damage to the environment. The naval forces of many countries conduct fisheries control patrols and environmental monitoring, including in ecologically sensitive areas such as Greenland. The protection of nuclear power stations and other critical infrastructure installations from terrorist attacks that could produce consequential damage to the environment is also among the responsibilities now given to militaries.

The fourth pathway consists of the *use of innovative technological solutions* that increase energy efficiency. This represents a promising yet costly pathway to reducing the military carbon footprint.

The reliance on alternative sources of power, such as biofuel, hydrogen, low-energy nuclear reactions (LENR), or lithium-ion batteries, would substantially lower GHG emissions. Two examples can help illustrate this trend. One, the U.S. Navy and the U.S. Air Force are actively experimenting with propulsion systems and engines powered with biofuel blends. Two, in 2020, the Japanese Self-Defense Maritime Force commissioned an attack submarine powered by lithium-ion batteries, the first in its class in the world. Furthermore, military units around the world are integrating renewable sources of energy (wind, solar, and tidal) to reduce their daily fossil fuel consumption in their permanent locations.

Defense industries are following suit by elaborating their environment-friendly policies. For instance, the Saab Group—the leading Swedish aerospace and defense company—targets reducing carbon emissions by 25 to 42 percent by 2030, in compliance with the UN 2030 Agenda for Sustainable Development and the COP process. The group also established a Climate Fund and aims to reduce the use of hazardous instances in its technological chain. Artificial intelligence tools play a growing role as enablers in attaining those ends.

Yet, there is still not too much clarity about how the mass transition to new technologies, including alternative fuels and propellants, would alter the operational and tactical performance of defense forces, especially in wartime. Furthermore, new technologies are a double blessing: for instance, 1 ton of pure lithium used for the manufacturing of lithium-ion batteries for submarines requires the mining of approximately 100 tons of ore, which produces polluting waste. Another example is the renewables-based "smart solutions," which are weather condition-dependent.

Nonetheless, the relatively fast shift of military forces to using new energy sources is not an impossible mission, as history demonstrates. The navies' changeover from coal to oil, prompted by World War I, took years, not decades. Likewise, the first nuclear naval propulsion was introduced less than a decade after the end of World War

II. Nowadays, we are witnessing a similar transfer. According to the U.S. Defense Logistics Agency, in 2022 it purchased 84 million barrels of oil, compared to 99 million barrels in 2018. The same source indicates that the GHG emissions generated by the U.S. military in 2022 dropped to 48 million tons from 51 million tons in 2021. There are various causal factors behind that trend, such as a reduction of the American military's posture overseas; however, the increased use of new technologies (e.g., the increased use of drones together with manned aircraft, fuel-efficient solutions) also contribute to this reduced figure.

It appears that the ice is breaking up and the era of military transition to new energy is unfolding steadily.

The fifth pathway aimed at controlling and limiting the environmental impact of military activity in war and peace is *expanded international cooperation*. Multilateral engagement and collaboration are key elements in reducing GHG emissions and other environmental aftermaths produced by military activities.

In this regard, NATO represents an illustrative example of a supranational politico-security body that firmly integrates the environment and climate into its strategic agenda. The 2022 NATO Strategic Concept outlined climate change as a "defining challenge of our times." That issue was on the agenda of all recent high-level NATO meetings; the last summit in Vilnius (2023) produced three reports in this regard.

Moreover, the Atlantic Alliance has developed a set of structures that deal with scientific research, analysis, and practical implementation of environmental solutions. Among them are the Science for Pease and Security Program, the Science and Technology Organization, the Environmental Protection Working Group, the Smart Energy Initiative, the Euro-Atlantic Disaster Response Coordination Centre, the Specialized Team on Energy Efficiency and Environmental Protection, and the Center of Excellence for Climate Change and Security in Montreal, Canada.

In addition, NATO has elaborated a range of directive documents in this regard, including the Green Defence Framework (2014), the Climate Change and Security Action Plan (2021), the Climate Change and Security Impact Assessment (2022), allied joint environment protection publications, and NATO standardization agreements (STANAG). These documents outline the Alliance's vision of climate and environmental challenges and its own politico-security roles and priorities in this regard. Furthermore, they formulate standards and technical requirements aimed at reducing carbon emissions and address other practical aspects, such as commanders' environmental awareness and responsibilities during the preparation and execution of operations.

The military-induced factors of climate change and environmental degradation, and the climate-conflict-security nexus, should become an integral part of an overall calculus and addressed appropriately.

Although the described architecture appears cumbersome and over-bureaucratized, NATO seems to be demonstrating its determination to implement practical measures to adapt to climate change and mitigate its harmful effects.

International conventions and treaties (such as the aforementioned Geneva Conventions) represent an essential legal track in limiting the environmental impact of wars and military activities. In this regard, there are special frameworks that restrict the proliferation of certain classes of land-contaminating weapons (e.g., landmines, cluster munitions) and regulate the military use of global commons.

The incorporation of scientific and public tracks could provide an essential supplement to multilateral and bilateral interstate cooperation and partnerships. Academia and think tanks significantly contribute to research related to climate change. For that particular reason, NATO's Science for Peace and Security Program finances scientific environmental projects in allied and partner nations (including the field of renewable energy technologies). International and national environmental non-governmental and non-profit organizations (e.g., the Conflict and Environment Observatory), grassroots movements, and other segments of civil society also play a role.

Green Takeaways

It took quite a long time for nations and governments to recognize the necessity of incorporating the military domain into the global green agenda. For instance, objections from some countries led to the omission of the reference to military activity in the 1997 Kyoto Protocol, which operationalized the UN

Framework Convention on Climate Change. The military-induced factors of climate change and environmental degradation, and the climate-conflict-security nexus, should become an integral part of an overall calculus and addressed appropriately.

Defense establishments, inherently conservative by nature, considered the commitments and requirements related to climate and environmental agendas as a liability that diverts their armed forces from their core warfighting missions while deleteriously affecting training, combat readiness, and operational performance. However, Western military culture and institutionalized civil-military relations based on subordination to civilian oversight eventually led to an acceptance of green codes of conduct as a conscious need. The presence of the NATO Secretary General and high-level U.S. Department of Defense delegations at all the recent UN Climate Change Conferences (including COP27 in Cairo and COP28 in Abu Dhabi) is a clear indicator of the ingraining of the environmental agenda into the military mind as one of their top strategic and operational imperatives.

However, a major problem still exists: not all state actors and none of the violent non-state actors recognize and accept the pressing need to address climate change concerns. The logic of *Realpolitik* and "pragmatic" revisionist strategies enables those actors to behave selfishly and irresponsibly, especially during times of war and armed conflicts. The enforcement and accountability related to the implementation of climate change-related international frameworks will remain a weak link from an observable perspective.

Additionally, the issue of climate change remains a highly politicized and debated matter, generating biases and controversies that affect the adaptation and implementation of practical measures, including in the defense domain. Adding more intricacy, certain environmental and ecological activist groups preach "militant anti-militarism" and even commit violent acts for their cause.

In the era of global competition and rising geopolitical tensions, the subject matter of climate change and the environment becomes even more important. Moreover, the inherent link between international security, climate, and the environment will grow stronger over time for a number of reasons, not the least of which is that climate change and environmental degradation increase the risk of wars and violent conflicts.

All collective multinational and individual national de-carbonization strategies and environmental policies should take seriously the military dimension in their ongoing deliberation, for the simple reason that military and paramilitary forces (in both times of peace and war) leave a significant carbon and environmental footprint, due to the nature of their professional activities and material capabilities. The willingness of some major military actors to take seriously their commitments to the climate and the environment—and the unwillingness of others to do so—could impede achieving consensus at forthcoming Climate Change Conferences.

Former U.S. Vice President and celebrated environmental activist Al Gore wrote in his 2013 book *Earth in the Balance: Forging a New Common Purpose* that, "We are the enemy, just as we have ourselves as allies." In many ways, the life of human beings looks like a war with themselves, and the Earth is indeed a war theater.

The full overcoming of the anthropogenic impact on the environment is a far-fetched undertaking; however, its mitigation and adaptation to reasonable limits is still conceivable. This process is extremely complex and costly, yet a deficiency or insufficiency of action will precipitate even more cost. The military-induced factors of climate change and environmental degradation, and the climate-conflict-security nexus, should become an integral part of an overall calculus and addressed appropriately. It would therefore be prudent for Azerbaijan's COP29 Presidency to incorporate that logic into its agenda and contribute to the development of consistent strategies and policies. BD