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Introduction

The war in Ukraine has re-invigorated NATO and underlined its importance as the cornerstone of Euro-Atlantic security and defense. In response to Russia’s actions, NATO has reinforced its eastern flank with a major new deployment of four battlegroups, it has activated its defense plans, and a majority of NATO members have committed to investing more in defense. The Alliance’s collective defense will likely assume an even more important place in the new Strategic Concept, which is up for formal adoption at NATO’s Madrid Summit in June 2022. While Russia’s activities pose a real threat to NATO’s member states, the Alliance should not lose sight of security risks emanating from transnational, actorless threats like climate change, which continue to shape our security environment. The war in Ukraine highlights the intersection of conflict, environmental degradation, and societal instability, as well as the need to reduce NATO’s reliance on fossil fuels, all of which make Allied armed forces more vulnerable.

This chapter will look at NATO’s efforts to reduce reliance on fossil fuels and enhance the efficiency of Allied military forces to date. With the Madrid Summit on the horizon, where the first Climate Change and Security Progress Report will be delivered, this section will also discuss what more NATO can do to contribute to global mitigation efforts and ways in which the organization can further support Allied militaries in their emissions reduction efforts.

NATO’s Climate Security Agenda

NATO, for the first time, acknowledged the link between climate change and security in its 2010 Strategic Concept. The focus of Allied efforts has been, first and foremost, on adaptation to the negative effects of climate change on military installations, operations, equipment, and force readiness. In the area of mitigation, the need to reduce reliance on fossil fuels and improve the energy efficiency of Allied military forces has been driven primarily by vulnerabilities associated with the provision of energy to front line operations – the frequent targeting of NATO fuel supplies, the high cost of transporting fuel to the battlefield, and the risk to troops involved in fuel logistics – rather than explicit climate change considerations.

Over the past two years, references to mitigation and the need to embrace a net zero transition have found their way into NATO’s public statements. At NATO’s Brussels Summit in June 2021, the NATO 2030 agenda and the Climate Change and Security Action Plan were adopted. In an important shift from earlier climate discussions within NATO, members of the Alliance pledged to “significantly reduce greenhouse gas emissions from military activities and installations,” tasking the Secretary General with the formulation of “a realistic, ambitious and concrete target for the reduction of greenhouse gas emissions by NATO political and military structures and facilities and assess the feasibility of reaching net zero emissions by 2050.”¹

In line with this commitment, the Climate Change and Security Action Plan outlines mitigation as one of the four lines of NATO's climate change efforts – in addition to enhancing awareness, adaptation, and outreach efforts.² As part of announced mitigation measures, NATO has started to develop a mapping methodology to help Allies measure their military emissions, which could contribute to determining voluntary cuts.

NATO's decarbonization efforts were most recently reaffirmed at the UN Climate Change Conference (COP26) in Glasgow. In an interview following his public remarks, NATO's Secretary General Jens Stoltenberg acknowledged that "there [was] no way to reach net zero without also including emissions from the military." Recognizing that the Alliance works by consensus, which continues to evolve, Stoltenberg added: "this is the aim but of course I am dependent on agreement among 30 Allies."³

Current Mitigation Efforts Primarily Focused at Enhancing Energy Efficiency

Both the consumption and the movement of fuel supplies have always been a critical yet challenging and dangerous part of any military operation. Large convoys of fuel transporters, which are required to provide energy on the battlefield, have often come under attack. It is estimated that between 2003 and 2007, 3000 US soldiers were killed or wounded in attacks on fuel and water resupplies in Afghanistan and Iraq – about one casualty for every 24 fuel convoys.⁴ Large quantities of ammunition and equipment are moved around too, which necessitates additional fuel.

Recognizing the vulnerability surrounding fuel supplies for deployed forces, in 2011 NATO's Emerging Security Challenges Division started working on enhancing energy efficiency in NATO under the banner of "smart energy".⁵ At the Chicago Summit in May 2012, Allies unanimously agreed on the subject of smart energy, stating their determination to "work towards significantly improving the energy efficiency of [their] military forces." This commitment was reiterated in the Wales Summit Declaration in September 2014.

Ever since, NATO has been supporting projects that aim to reduce fossil fuel dependence in military camps, enhance renewable energy usage, and incorporate innovative technologies and approaches within military capability. Following the Chicago Summit Declaration, a **Smart Energy Team (SENT)** was established in 2013 with a two-year mandate to identify and spotlight best practices and opportunities for collaborative multinational smart energy projects. SENT was tasked with six concrete deliverables,⁶ all of which were achieved.

¹ "Brussels Summit Communiqué," *NATO*, 14 June 2021, Available at: https://www.nato.int/cps/en/natohq/news_185000.htm.

² "NATO Climate Change and Security Action Plan," *NATO*, 14 June 2021, https://www.nato.int/cps/en/natohq/official_texts_185174.htm.

³ Mark John, "NATO chief: Armies must keep pace with global climate efforts," *Reuters*, 2 November 2021, Available at: <https://www.reuters.com/business/environment/nato-chief-armies-must-keep-pace-with-global-climate-efforts-2021-11-02/>.

⁴ "NATO and its partners become smarter on energy," *NATO*, 7 April 2015, https://www.nato.int/cps/en/natohq/news_118657.htm.

⁵ Smart Energy Team (SENT) defined smart energy as "the methods of providing energy to the user in a practical, effective, sustainable and environmentally responsible manner." See: *The Smart Energy Team (SENT) Comprehensive Report*, 6 May 2015.

SENT's Comprehensive Report, published in 2015, concluded that a number of NATO and Partner nations had successfully implemented smart energy technologies and had established strategies, policies and standards for smart energy use in the military. In spite of a desire and willingness for collaboration and knowledge sharing, the Report acknowledged that there was however a lack of cooperation between defense, academia and industry within as well as among NATO nations, with most national initiatives having been carried out in isolation. The report further identified that there was a lack of energy efficiency requirements in military procurement, and that policies, procedures, standards and the overall knowledge and awareness on smart energy across the Alliance were insufficient.⁷

In addition to SENT, NATO's Science for Peace and Security (SPS) Programme also supported Serbian-led research into biofuel production from algae in 2017-2020,⁸ as well as the "Camp Energy Efficiency" project, launched in 2018 in Canada, which sought to develop interoperable monitoring kits for energy data collection with the aim to identify and address wasteful energy consumption in deployed military camps.⁹

Since 2013, NATO has been holding **Capable Logistician exercises** with the aim of testing and demonstrating various energy-saving technologies, as well as their interoperability, in the field. "Smart energy" camps, showcased during the exercises, included solar panels and energy saving LED lights, hybrid energy system grids, insulation for tents, intelligent power storage and management capabilities, and water purification systems.¹⁰

The **Green Defence Framework**, adopted in February 2014, was an important step forward as it provided NATO staff and national experts with a broad basis for cooperation on green solutions for defense.¹¹ The Framework made several innovative suggestions to reduce the energy consumption of Allied armed forces, as well as a proposal to apply "green standards" across NATO's political and military structures and facilities (See Table below). The momentum for mainstreaming green solutions was interrupted by Russia's illegal annexation of Crimea in March 2014, which took place only weeks after the Framework was adopted. NATO's renewed emphasis on collective defense is believed to have impeded a more systematic pursuit of the various innovative initiatives proposed in the Framework.¹²

⁶ 1) project proposals, 2) a comprehensive report, 3) field trip assessments, 4) contributing a component to Exercise CAPABLE LOGISTICIAN 2013, 5) raising public awareness and 6) establishing an information sharing internet platform. See *The Smart Energy Team (SENT) Comprehensive Report*, 6 May 2015.

⁷ *The Smart Energy Team (SENT) Comprehensive Report*, 6 May 2015.

⁸ "NATO-funded Serbian researchers develop biofuel from algae," *NATO*, 18 August 2017, https://www.nato.int/cps/en/natohq/news_146424.htm.

⁹ "New NATO scientific project to reduce energy consumption of deployable camps," *NATO*, 2 October 2018, https://www.nato.int/cps/en/natohq/news_158964.htm.

¹⁰ See for example: "NATO Smart Energy: Capable Logistician 2015," *NATO*, 6 May 2015, https://www.nato.int/nato_static_fl2014/assets/pdf/pdf_2017_08/20170808_Smart-Energy-Ex-Capable-Logisti.pdf.

¹¹ "Green Defence Framework," *NATO*, February 2014, Available at: https://natolibguides.info/ld.php?content_id=25285072; *The Smart Energy Team (SENT) Comprehensive Report*, *NATO*, 6 May 2015, Available at: <https://www.nato.int/science/project-reports/Smart-Energy.pdf>.

¹² Michael Ruehle, "Scoping NATO's environmental security agenda," *NDC Policy Brief*, No. 6, March 2020.

THREE PILLARS OF NATO'S GREEN DEFENCE FRAMEWORK

Reinforcing efforts of NATO bodies

- Identifying a focal point within existing structures to improve overall coordination and streamlining of activities
- Development of "green" accounting and benchmarks to measure progress
- Comprehensive database on energy consumption of NATO operations
- Factoring green defense into NATO training, education and exercises

Facilitating Allies' efforts

- Creating a platform for sharing of lessons learned, best practices and nationally-developed "green" technologies
- Incorporating questions about national Green Defence activities in the Defence Planning Capability Survey (DPCS)
- Exploring projects on "green" capabilities and equipment
- Promoting environmental protection and developing STANAGs in this area

External engagement: Improving NATO's "green" profile

- Improving cooperation with partner nations and the private sector
- Better communication with the general public
- Leveraging various public diplomacy tools (incl. through relevant NATO COEs)
- Coordinating with other international organisations to avoid unnecessary duplication, including through mutual briefings
- Using NATO activities as test beds for new technologies

Energy efficiency has also been reflected in NATO policies, namely the *Policy on Power Generation for Deployed Forces Infrastructure* and *NATO Military Principles and Policies for Environmental Protection*, which currently constitute two umbrella documents for further development of NATO standardization in the area of smart energy.¹³

Finally, the NATO Energy Security Center of Excellence, located in Lithuania, has devoted a large share of its activities to enhancing the energy efficiency of Allied armed forces.¹⁴ Since its establishment in 2012, the Center has generated knowledge, expert advice and solutions for development of energy efficient forces, as well as training courses that either concentrate on or at least feature "smart energy" modules.¹⁵ The planned NATO accredited Center of Excellence on Climate and Security, which Canada has offered to host, is also expected to support NATO's mitigation efforts. While the Center's design is yet to be completed, once established, the Center could serve as a hub for the exchange of best practices and lessons learned, help address the above-mentioned lack of knowledge and awareness of the operational benefits of green solutions through courses for all levels of the NATO command structure, and make NATO's "green" profile more visible through public communications campaigns and public events.¹⁶

Even though NATO's primary objective has been to reduce reliance on fossil fuels when in the field, and to make Allied militaries more energy efficient, the above-mentioned activities also help reduce CO2 emissions from military operations and, as such, contribute to global mitigation efforts.

¹³ *Smart Energy Team (SENT) Comprehensive Report*, NATO, 6 May 2015, Available at: <https://www.nato.int/science/project-reports/Smart-Energy.pdf>.

¹⁴ "NATO Energy Security Centre of Excellence: About," <https://enseccoe.org/en/about/6>.

¹⁵ Susanne Michaelis, "How NATO is making progress in energy efficiency for military forces," *Eyvor Institute*, 27 February 2018, Available at: <https://eyvor.org/how-nato-is-making-progress-in-energy-efficiency-for-military-forces/>.

¹⁶ Selected takeaways of the Expert Engagement Workshop titled "Informing Design of a NATO Climate and Security Center of Excellence," Government of Canada, 26 April 2022 [online].

Looking Ahead: What More Can Be Done Within NATO's Mandate?

It is important to bear in mind that NATO does not have the power to legislate and cannot impose binding emissions reduction targets on Allied militaries, which is a national competency. In the words of Dr. Michael Ruehle, Head of Climate and Energy Security Section at NATO, "NATO is not a first responder to climate change. This role is played by other international bodies, in particular those who can set limits on CO2 emissions."¹⁷ NATO instead seeks to become "the leading international organization when it comes to understanding and adapting to the impact of climate change on security," as the NATO 2030 agenda confirmed in 2021.¹⁸ Even though the Alliance does not seek to position itself as a "first responder to climate change," it nevertheless has a range of tools in its toolbox that can support Allied emissions reduction efforts, both directly and indirectly.

At NATO's Brussels Summit in June 2021, NATO set out to develop a **methodology** to help Allies measure their emissions from military activities and installations. This methodology will draw on the best practices of Allies and expertise residing in partner nations and other international organizations, including the EU. To this end, NATO is currently compiling a **best practices compendium** in order to better understand how different Allies approach emissions mapping and which models could be replicated across the Alliance.¹⁹ Once military emissions are known, NATO could set voluntary targets for their reduction. The Secretary General has already been invited to formulate a realistic target and assess how feasible it would be for Allied militaries to reach net zero emissions by 2050. For voluntary targets to work, they will need to be accompanied by a robust and agreed reporting mechanism.

Next, NATO could **shift away from single fuel policy (SFP)** towards more sustainable alternatives, like biofuels or synthetic fuels.²⁰ Under SFP, which is designed to simplify the logistic effort and enhance equipment interoperability, NATO forces aspire to use only one fuel on the battlefield – F-34 to be precise. In an effort to reduce the negative environmental impacts of their military activities, Allied militaries are already increasing the use of sustainable aviation fuel. The US began the process over a decade ago with the "Green Hornet" biofuel-powered flight, and the UK followed suit in 2020 when it changed its aviation fuel standards to allow substitution by sustainable fuels up to 50 percent in all military aircraft.²¹ The Dutch Ministry of Defense aims to ensure that by 2030 all military aircraft will fly on a 20 percent addition of biofuels, and a 70 percent biofuel blend by 2050.²² In addition

¹⁷ Michael Ruehle, "Scoping NATO's environmental security agenda," *NDC Policy Brief*, No. 6, March 2020.

¹⁸ *NATO 2030 Factsheet*, June 2021, Available at: https://www.nato.int/nato_static_fl2014/assets/pdf/2021/6/pdf/2106-factsheet-nato2030-en.pdf

¹⁹ Remarks by Michael Ruehle, "Climate insecurity and geopolitics in the Arctic," *European Policy Centre (EPC)*, 16 February 2022, Available at: <https://www.epc.eu/en/events/Climate-insecurity-and-geopolitics-in-the-Arctic~4582ec>.

²⁰ See *Energy Highlights*, NATO Energy Security Centre of Excellence, 2021, Available at: https://enseccoe.org/data/public/uploads/2021/10/d1_military-aspects-of-energy-security.pdf.

²¹ "Green Hornet", *US Department of Defense*, Available at: <https://www.defense.gov/Multimedia/Photos/igphoto/2002002645/>; "Sustainable fuels to power RAF Jets," *GOV.UK*, 12 December 2020, Available at: <https://www.gov.uk/government/news/sustainable-fuels-to-power-raf-jets>.

²² "Duch Ministry Implements Biofuel into Military Aviation," *Biofuels International*, 23 January 2019, Available at: <https://biofuels-news.com/news/dutch-ministry-implements-biofuel-into-military-aviation/>.

to alternative fuels, NATO could also lead the way in research and development of **alternative propulsion systems** for military applications.

Through the NATO Defense Planning Process (NDPP), which identifies the capabilities required by the Alliance and ensures coherence in their development, NATO could develop **green minimum capability requirements** for each Ally to meet.²³ This could serve as an incentive for Allied nations to reduce their military emissions and shift to sustainable technologies. While capability requirements set out in the NDPP do not constitute a legally binding commitment, they do drive national defense planning. In addition, NATO has a successful track record as a standard-setter. NATO can **update existing policies and standardization agreements** (STANAGs), as well as introduce new ones. According to Dr. Susanne Michaelis, former Science Officer at NATO's Emerging Security Challenges Division, new standards in the area of smart microgrids would constitute a quick win for reducing the fuel consumption of field camps.²⁴ Even though the Alliance cannot mandate interoperability of national forces, units and/or systems, STANAGs are binding on Allies that ratify and implement them. In general, NATO standards get a lot of support in the logistics community and are recognized and generally adhered to in manufacturing practices, too. This is due to the fact that STANAG's offer a bigger market (30 nations), and are a sign of quality for export.²⁵

At this moment, NATO has limited collective financial means in the civilian budget to do more on climate change. Given that NATO member states' commitment to spend at least 2 percent of GDP on defense is up for review in 2024, the NATO 2030 Young Leaders Group proposed to **reimagine what counts as a defense contribution** moving forward. According to the Group, the reformed 2 percent target after 2024 should also account for investments in areas such as climate security, economic resilience or anti-hybrid warfare, helping Allies achieve resilience across the board.²⁶ The Defense Investment Pledge endorsed in 2014 also calls for Allies to spend 20 percent of total defense expenditures on major new equipment and R&D.²⁷ Some of this could be directed towards the **development of sustainable technologies** (both military and dual use). In addition, former NATO Deputy Assistant Secretary General for Emerging Security Challenges Dr. Jamie Shea suggested setting up a **NATO Green Fund** that could help finance trials and demonstrations and assist less advanced Allies in greening their militaries.²⁸

The use of more sustainable technologies forms an important part of the mitigation solution. Deliveries by drones or 3D printing of weapons systems, components and ammunition at the point of use offer significant savings in terms of the logistics burden and fuel use on the

²³ Susanne Michaelis, "Smart Energy: Less Fuel, More Power," in *Sustainable Peace and Security in a Changing Climate: Recommendations for NATO 2030*, NCWES, 30 April 2021, <https://www.brusselsdialogue.net/more-about-the-report/inside-the-report>.

²⁴ Susanne Michaelis, "How NATO is making progress in energy efficiency for military forces," *Eyvor Institute*, 27 February 2018, Available at: <https://eyvor.org/how-nato-is-making-progress-in-energy-efficiency-for-military-forces/>.

²⁵ Interview results, 8 April 2022.

²⁶ NATO 2030 Young Leaders Group, "NATO 2030: Embrace the change, guard the values," *NATO*, February 2022, <https://www.nato.int/nato2030/young-leaders/>.

²⁷ "Funding NATO", *NATO*, 1 April 2022, https://www.nato.int/cps/en/natohq/topics_67655.htm.

²⁸ Jamie Shea, "NATO and Climate Change: Better Late Than Never," *GMFUS*, 11 March 2022, Available at: <https://www.gmfus.org/news/nato-and-climate-change-better-late-never>.

battlefield. Because the private sector drives much of green innovation today, NATO Allies need to work alongside civilian agencies, private-sector companies, and research institutions. Cooperation with civil society and the private sector is also important for NATO's own awareness about the latest technological developments and their societal impact.

NATO can scale up innovative low carbon technologies through its own procurement practices and buying power. While individual Allies have the power and influence over the procurement of military equipment, NATO as an organization can lead with regard to **common funded infrastructure** (i.e., fixed installations which are necessary for the deployment and operations of the armed forces)²⁹ and the equipment and technologies that support NATO's Command and Control (C2). For example, sustainability and energy efficiency were integrated within the design of the new NATO Headquarters.³⁰

Financing and coordination with innovators from across the Alliance could be achieved through **NATO's Defense Innovation Accelerator for the North Atlantic (DIANA)** and the **NATO Innovation Fund**, both of which are set to be launched by 2023. The Innovation Fund will invest an initial 1 billion EUR (U.S. \$1.1 billion)³¹ to help early stage start-ups grow and to support NATO's technology needs. DIANA, which comes with more than 10 accelerator sites and 50 test centers in Europe and North America, will help military personnel work more closely with the Alliance's technology companies, start-ups, and scientists to develop technological solutions to existing and future security threats.³² While the initial focus of these two NATO initiatives will be on seven emerging and disruptive technologies³³, the innovation sites and funding could conceivably be extended to support research and development of sustainable technologies in the future, as the program develops.

The Need for Increased Ambition and Action

Allied militaries generate considerable emissions in peacetime and even more emissions when they are at war. NATO needs to move beyond merely acknowledging the security implications of climate change and adapting its forces to extreme circumstances. It should also step up its efforts to incentivize Allies to reduce their military emissions and shift to sustainable technologies.

While NATO – notably under Jens Stoltenberg's leadership – has formally embraced the need for Allied militaries to reduce their emissions, target setting falls under the competence

²⁹ NATO's assets include airfields, signals and telecommunications installations, military headquarters, fuel pipelines and storage, radar warning and navigational aid installations, port installations, missile installations, forward storage sites and support facilities for reinforcement forces. Such installations are financed collectively and may be used by each Ally. Source: "Aspects of NATO - Infrastructure and Logistics," NATO, 1 January 1982, https://archives.nato.int/uploads/r/null/1/3/137761/0196_Aspects_of_NATO-Infrastructure_and_Logistics_ENG.pdf.

³⁰ "NATO Headquarters," Skidmore, Owings & Merrill (SOM), Available at: <https://www.som.com/projects/nato-headquarters/>.

³¹ These are public funds that participating nations can allocate, either from their existing defense budgets or established innovation funds.

³² "NATO sharpens technological edge with innovation initiatives," NATO, 7 April 2022, https://www.nato.int/cps/en/natohq/news_194587.htm.

³³ Artificial intelligence, big-data processing, quantum-enabled technologies, autonomy, biotechnology, hypersonics, and space.

of individual member states. NATO cannot set binding targets, nor can it enforce investments in green technologies. Individual Allies have the power and influence over the procurement of military equipment. NATO can nevertheless lead by example and incentivize military decarbonization through different standardization agreements, by setting net zero and sustainable targets for defense planning, or by shifting away from its single fuel policy towards more sustainable alternatives. With its long and successful track record as a standard setter, NATO taking climate change seriously can have a normative influence on NATO's Allies as well as partners world-wide.

According to the Secretary General's Annual Report, 2021 was the seventh consecutive year of rising defense spending across NATO.³⁴ The outbreak of the war in Ukraine has prompted Allies to invest even more in defense. As Allies increase their defense budgets, and before contracts with defense manufacturers have been signed, they need to think carefully about what capabilities are needed and ensure that fuel and energy efficiency standards are factored into the development of new and more technologically advanced systems and platforms.

Finally, military conflict itself is a significant driver of climate change and environmental damage. Effective deterrence, which is a core element of NATO's overall strategy, plays a vital role in preserving peace and preventing future conflicts and – by extension – future emissions. In addition to boosting its deterrence, NATO needs to improve its early warning and strategic foresight capabilities to better understand the root causes of war and, where possible, address them.³⁵

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³⁴ "The Secretary General's Annual Report 2021," *NATO*, 31 March 2022, https://www.nato.int/cps/en/natohq/opinions_193590.htm.

³⁵ NATO 2030 Young Leaders Group, "NATO 2030: Embrace the change, guard the values," *NATO*, February 2022, <https://www.nato.int/nato2030/young-leaders/>.