PART 4

Mitigation

CHAPTER 13

Cleaner Conflicts? Energy Transition and Green Innovation in the Dutch Army

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Abstract

Military actors increasingly view climate change as a challenge to international security and peacekeeping operations. But these same armed forces also produce environmental harm themselves: their operations, supply chains, and bases damage local ecosystems and generate significant greenhouse gas emissions. The Dutch Army is currently looking to combine adaptive military strategies and operations with more sustainable solutions. Focusing on energy transition and dual-use technologies, this chapter investigates how the Dutch Army integrates environmental goals, scientific expertise, and industry innovations in military operations. By extension, this work contributes to mitigating the environmental harm that military strategies pose to civilians and ecosystems in conflict zones. In our conclusion, we critically assess the greening of the military in mitigating climate change and environmental harm.

Keywords: energy transition, security, peacekeeping, military, civilian, innovation, operations

13.1 Introduction

War and military operations have always been particularly destructive to the environment (Depledge, 2023; Gould, 2007). In the first place, they directly damage and destroy the environment and contaminate water, land, and air (Jorgenson et al., 2012). Ever since the Russian invasion in 2022, the Ukrainian government and the United Nations Environmental Program (UNEP) have carefully registered environmental damage and risks. These reports demonstrate that Ukraine's government and society are grappling with multiple crises associated with chemicals, munitions, and military equipment, the presence of a range of pollutants continuing to be released during the active phase of the conflict, the damage inflicted on fuel storage facilities, industrial infrastructure, key infrastructure such as water, energy, and waste management systems, urban areas, agricultural and natural areas. Assessing such damage will require a multitude of complex methods to establish the impacts and plan recovery activities. It is also important to emphasise that the effects war has on the environment go beyond borders, impacting, for example, maritime life and ocean ecosystems. Effects hereof have been called a form of “slow violence” (Nixon, 2011): one that is less visible and one of delayed destruction.

In addition to the environmental harm of warfare, the energy consumption of military actors is also under increased scrutiny. The military consumption of fossil fuels has increased immensely over the past decades, and estimates suggest that they account for 5.5% of the total amount of greenhouse gas emissions (Parkinson & Cottrell, 2022). Several factors complicate monitoring the carbon foot or boot–print of state armed forces, one being that governments do not have to register and account for their emissions (Ambrose, 2021). At the same time, many other (indirect) effects of military activities are often unaccounted for, including those of military bases and militarised environments (Woodward, 2004). For example, a journalist pointed out that many of the Dutch Ministry of Defense (MoD) sites are heavily contaminated (Kuijpers, 2023). Researchers and policymakers advocate for the development of international reporting requirements and accurate methodologies to calculate military emissions. While the analysis of a military’s fossil fuel consumption, Mohammed Ali Rajaeifar and colleagues (2022) point out, would always be complicated due to a variety of reasons, it remains essential to break down targets and policy priorities that aim to reduce the ecological impact of military activities.

Military actors increasingly recognise their role as climate actors. They explore how they can lower their emissions and use of fossil fuels while maintaining, or even improving, operational effectiveness (Middendorp, 2022). So far, military actors seem particularly interested in energy transition and consider the innovation and development of new technologies essential to realise a shift away from costly fossil fuels while also lowering risks and vulnerability. For example, in 2022, NATO stated that it wanted to reduce the gas emissions by armed forces of member states by at least 45% by 2030 (Kõrts, 2022). A goal mirrored by the Dutch government in their military sustainability strategy, striving for a reduction in fossil fuel consumption of 20% by 2023, and 70% by 2050 (Defensie, 2021). Such goals, however, require ambitious and long-term projects and strategies that reduce operational demands and make available alternative energy sources (Erdogan et al., 2022)

There are many opportunities for the Dutch Army to reduce its environmental impact while also fulfilling its mandate and national responsibilities. Moreover, a transition to alternative energy sources could also make the Army more independent and self-reliant; contributing to its overall effectiveness and lowering costs rather than negatively impacting its activities. In this chapter, we examine how the Dutch Army integrates environmental goals, scientific expertise, and industry innovations in a military capacity and, potentially, in future operations. We are specifically interested in the Army’s transition to more sustainable energy sources and how this shapes operational capacity and strategy. How is the societal challenge of sustainability and the threat of climate change translated into military capability development and practice? In answering this question, we analyse policy documents, and public statements, as well as draw on the experiences and insights of the second author, who works at the Innovation Branch of the Dutch Army. This offers an insider account and perspective on the processes and decisions that shape the energy transition and innovation efforts of the Dutch Army.

We found that the Army is rapidly expanding its network and collaborations, efforts that increasingly involve business-like and societal partnerships. Indeed, there is a growing realisation that there is much to learn from research centres, policymakers, and corporations when it comes to transitioning to alternative energy infrastructure and low-carbon warfare. New and creative innovations are developed and "dual-use" technology is tested to understand how and where the Army can lower its carbon footprint. The term "dual use" in this sense refers to technologies that can both be used in military and civilian settings (Forge, 2010). This also recognises that civilian industries have become highly innovative, while military actors have seen declining budgets in the past decade (Mowery, 2012; Torres, 2018). While the Dutch Army values the potential and opportunities of civilian industries and innovations for military development, they also become increasingly dependent on corporations and commercial technologies in any attempt to transition to low-carbon operations and strategies. This also means that market dynamics and governmental policies surrounding the development and purchase of new materials and technologies shape the future of military operations in an era affected by climate change.

In the next section, we discuss in more detail the relationships between energy, conflict, and the military. Our focus on energy transition and the Dutch Army also necessitates the introduction of a Green Conflict Studies agenda: centring the question of how environmental issues and challenges impact or are impacted by conflict and warfare. This also means recognising the military as a climate actor and driver of other industries, societal processes, and producers of scientific research, technologies, and knowledge surrounding climate change and ecological damage. Next, two more empirical sections will discuss the role of dual-use technology in the Dutch Army and the practicalities underlying the energy transition. In our conclusion, we critically assess the greening of the Army in mitigating climate change and environmental harm.

13.2 Energy, Conflict, and the Military

Many nation-states have used military power and violence to ensure or expand their domination of fossil fuels and support national economies (Gould 2007). This ecological imperialism has led to much violence and conflict, ranging from the

Iran-Iraq War of 1980–1988, or the Gulf War of 1990–1991. But also, beyond these more "renowned" fuel conflicts, military missions and operations have strong yet more implicit connections to oil and gas. According to Greenpeace (2021), "Almost two-thirds of all EU military missions monitor and secure the production and transport of oil and gas to Europe".

While alternative energy sources and systems are necessary to lower greenhouse gas emissions, it is important to recognise the broader levels of power and domination intrinsic to energy itself. Cara Daggett (2020) critiques a narrow focus on more sustainable energy sources and technologies. Reflecting on earlier energy transitions (the rise of agriculture and steam engines), Daggett argues that energy transitions are inherently a political innovation – not an outcome of more efficient or sustainable technology. "Those seeking just transitions," she writes, "go beyond asking which fuel technologies are used, and pay attention to which groups and interests control and benefit from energy systems" (2020, 646). Political will and domination make energy transitions possible, regardless of whether new technologies are inferior or suboptimal in terms of human well-being, quality, and economic efficiency. It is no surprise that the current widespread interest in more sustainable energy sources and independent infrastructures occurs parallel to a ravaging war – in which one party is an important provider of gas – and increased political tensions on an international stage. That means that studying energy is ultimately about the relationships between humans and their desire for energy.

Understanding the relationship between energy, conflict, and the military also requires us to look beyond the dichotomies of peace and war. Militaries act as major climate actors also because of the production of military weapons and materials, as well as the "logistical supply chain that makes its acquisition and consumption of hydrocarbon-based fuels possible" (Belcher et al., 2020, p. 65). This seems particularly urgent in light of what scholars have called the "everywhere war": an intensifying imperative for military responses and readiness across a multitude of converging dimensions and geographies (Gregory, 2011). Instead of delineating where military operations and warfare begin and end, then, it is necessary to recognise the role of state armed forces in climate change as a political actor and consumer of fossil fuels, much like any other industry.

Unlike other industries, however, military activities are often exempt from environmental regulations and protection in the name of national security. "That exemption," Kenneth A. Gould writes, "has made military production facilities the most ecologically devasted locations on Earth" (Gould, 2007, p. 331). This also relates to the entanglements between corporate industries and military operations: the so-called military-industrial complex. The production, storage, transport, and use of military equipment are inherently connected, which means that the military's environmental impact cannot be separated from the corporate dimension.

Since it is unlikely that military actors will rely completely on sustainable energy sources soon, Duncan Depledge (2023) uses the term "low-carbon warfare" to capture what a shift away from fossil fuels might mean for military activities in practice. These activities are not limited to actual combat encounters: they also relate to training and the development and maintenance of military bases and equipment. Aspirations and attempts to decarbonise state armed forces and warfare are likely to affect the character of military operations in various ways. This is first and foremost because military activities heavily rely on the supply, transport, and consumption of fossil fuels. Yet the use and costs of oil have increased enormously over the past decades. In addition, military forces suffer additional casualties in attempts to protect their fuel convoys (Depledge 2023), which also add to the costs of military activities and combat missions. This eventually accumulated growing pressure on NATO and Western forces to reduce energy consumption and transition to alternative and sustainable sources that, importantly, also improve the operational capacities of these units and lower their vulnerability. Decarbonisation and the transitions towards more sustainable sources, in other words, are interpreted through military goals and activities.

While lowering the emissions of greenhouse gases would be admirable and desirable, it is second to operational imperatives and military doctrine developed to defend national interests. Indeed, to military actors, the idea of energy security is somewhat different from the more conventional use in terms of economic and political independence. "Defense energy and security efforts are more directed at achieving military missions and strategic objectives" (Samaras et al., 2019, p. 1). Military actors are primarily interested in energy transition when it also reduces the vulnerability of its operations, and the research and development of new technologies to realise and implement new energy systems should be understood in this light. At the same time, we would like to downplay a claim of "defense exceptionalism" and point out how military energy concerns often collide and shape civilian energy needs and industries.

Especially in times of conflict, military energy needs often prevail over civilian needs, where "the military would be the first buyer of any domestically produced fuels, and the US Defense Production Act enables the President to prioritise energy procurement for national security" (Samaras et al., 2019, p. 2). Academics and policymakers even identify the economic opportunity and political incentive to increase military-civilian collaborations in this regard, "especially as one considers the greening of the military operations" (Samaras et al., 2019, p. 9).

Focusing on the US military's supply chains, Oliver Belcher and colleagues (Belcher et al., 2020) investigate various sub-agencies of the US military, documenting how energy, services, and munitions are delivered. Uncovering the US military self-provisioning of infrastructure and material resources, the authors document the conditions under which these armed forces have operated over the past 20 years. These "military doctrines", or "combat paradigms", have significantly altered its hydrocarbon infrastructure. For example, the contemporary form of "hybrid warfare" involves the use of information-based technologies and drone warfare, as well as an energy system that enables it. Studying this overlooked section of the military apparatus, the authors point out, "is important to expose the oft-overlooked aspects of the military's ability to wage the everywhere war" (Belcher et al., 2020, p. 67). What is particularly insightful here is that they demonstrate how military operations are ultimately embedded and enabled by political choices and economic interests made in the past.

Innovation, not just in the context of climate change, has increasingly become the main strategy for militaries across the world to respond to a range of identified threats. As part of this development, warfare and armed conflict became an opportunity to experiment. Marijn Hoijtink (2022) points out that wars are endless and everywhere, not because of the representation of the enemy, but exactly because of the broader experimental infrastructure that is created and that needs to be maintained. This emerging interest in low-carbon warfare is not new from a Western perspective and could be aligned with a military doctrine that aims to "conduct the business of war through a combination of self-restraint, risk transference and a reliance on technological 'fixes', all girded by a persistent belief in the utility of force to as a means to securing political ends" (Depledge, 2023, p. 677)

Until more recently, political choices have always perpetuated and intensified hydrocarbon-based path dependencies. Several military actors increasingly experiment and develop new military hardware and supply chains. The United States military has become a prominent case in point. In 2012, the US Navy demonstrated its latest naval strike force, the "Great Green Fleet" (GGF). The GGF is exemplary of a broader, yet often discursive, attempt to change the military's "long-standing and complicated logistical relationships with fossil-fuel infrastructures in light of emerging geopolitical entanglements influenced by climate change" (Bigger & Neimark, 2017, pp. 13-14). This is not a form of "greenwashing"; a way of marketing and otherwise publicising sustainability efforts that are marginal at best, and non-existent or counterproductive at worst. "The Navy's move toward biofuels is framed as a 'win-win-win'", Patrick Bigger and Benjamin D. Neimark argue, "as it looks to deliver positive environmental outcomes, while also furthering national security priorities and subsidizing a new US industry. These three aims are coincident with the analytical outlook of geopolitical ecology, encompassing geopolitics and political ecology, which in turn integrates political economy with environmental change" (Belcher et al., 2020, p. 14)

With climate change as a major factor for contemporary preparations for future conflict, the GGF is about building "infrastructure capacity and changing material provision, including US unconventional fuel refining and distribution capacity" (Bigger & Neimark, 2017, p. 14). Critical of the military's environmental projects and ambitions, the authors warn that militaries might mobilise specific projections of future threats in which the military itself is essential for responses to these impending dangers. Breaking away from fossil fuel infrastructures, then, is about enabling more military flexibility and capacity to respond to these threats. Consequently, the alignment of goals between civilian and military actors, particularly in the domain of energy, provides an intriguing subject for study. In the next section, we introduce the underlying notions of the Dutch Army's attempt to materialise a future base of military operations.

13.3 Energy Transition in the Dutch Army

The civilian industry has traditionally functioned as a customer-supplier relationship for the military. In recent times, however, there has been a transition towards working with civilian partners more collaboratively. The military is now seeking to address societal challenges by embracing an open innovation approach, where cooperation partners play a more significant and transparent role. This departure from the conventional technology-driven approach to weapons production signifies a willingness to innovate in response to societal concerns. We identify two main dimensions through which the Dutch Army seeks to transition to alternative energy sources and systems: (1) the development and implementation of Dual-Use Technology, and (2) the innovation within the experimental platform of the FieldLab SmartBase.

13.3.1 Dual-use technology

When it comes to transitioning to alternative energy infrastructure and low-carbon warfare, the Dutch Army's primary motivator is to reduce exposure to uncertainty and vulnerability. This includes strategic autonomy (e.g. no Russian oil and gas), less dangerous logistics (i.e., transporting fossil fuels through areas of conflict), and increasing self-sufficiency in the field. With mounting pressure from political and societal actors, the Dutch Army considers "dual-use" technology to be key in addressing the challenge of lowering their carbon footprint. Energy transition in the Dutch Army holds significant importance within the context of specific geopolitical and ecological conditions that shape conflicts. The Dutch armed forces' need for military innovation is intimately tied to their three core tasks: defending national and allied territories, enforcing the national and international rule of law, and providing disaster and crisis assistance. As indicated by multiple press releases and policy documents, the Dutch government acknowledges that climate change and energy transition have direct implications for the security landscape, thereby influencing operations associated with these core tasks.

Specifically related to sustainability in the armed forces, the MoD states that climate change and energy transition directly impact the security situation and therefore influence operations related to these three core tasks of the Dutch armed forces. To address sustainability within the armed forces, the Dutch MoD has outlined three mission statements that encompass a range of objectives. First, the MoD is concerned with the anticipation of climate change effects in the design of military operations and examines which "adaptations" are required. Examples here include the potential to reuse water in military camps and to make properties more sustainable. Second, the MoD wants to reduce its dependency on fossil fuels, adhering to the Dutch government-wide goal of reducing CO_2 emissions by 55% by 2030. The MoD states it will invest heavily in high-performance equipment in the coming years. Since they expect fuel consumption to increase, they highlight that military equipment will have an increasing impact on total CO_2 emissions. About 60% of the MoD's CO_2 emissions come from operational equipment, which includes military, encampments, and the equipment of individual soldiers. Kerosene has by far the largest share of operational equipment emissions (more than half), followed by marine diesel and the diesel consumed by vehicles. Third, the MoD strives to develop the circular use of material, goods, services, and infrastructure. Concerned with diminishing raw materials, the MoD expresses a desire to reduce their use of these resources and work towards climate-neutral business operations (van der Maat, 2023). The MoD believes that the achievement of these mission statements relies on the development of innovative military concepts and the adaptation of existing ones.

The Dutch Army employs "concept development and experimentation" (CD&E), which aligns with the NATO doctrine in facilitating the creation and refinement of the necessary novel military concepts. This process involves a comprehensive analysis of operational requirements, followed by the identification and testing of potential solutions within an experimental framework before their implementation across military services. The CD&E process not only validates technological solutions but also facilitates the development of associated military concepts, which define the operational procedures and implications of introducing novel technologies into military organisations and operations (Kõrts, 2022). This process further concentrates on the use of available solutions in existing markets, as opposed to more lengthy technological development programs that follow a linear Research and Design structure. This means that the MoD is specifically interested in civilian concepts with a high level of maturity or readiness, and not so much in developing new technologies, purely designed, and tested for the military setting. The Army's Innovation Branch focuses on these dual-use themes, of which energy transition is a priority, and establishes connections and partnerships between civilian societal challenges, technological opportunities, political needs, and military realities.

The CD&E process encompasses several distinct phases, ensuring a systematic approach to testing and implementing novel technologies. The four main phases of this process, as operationalised by the Army, are outlined below. The first phase, scouting of CD&E opportunities, involves active surveillance of technological advancements and external collaborations to identify relevant solutions in civilian settings that align with operational needs. The second phase, the articulation of operational needs, involves a comprehensive analysis of the requirements, considering factors such as logistics, maintenance, compatibility with current military practice, and the impact on existing doctrine (such as the use of energy sources). The objective is to create a clear understanding of the implications of implementing the novel technology in military operations. A third phase focuses on conducting experiments and developing and refining the associated military concept. It involves testing the identified solution in experimental settings to assess its feasibility, functionality, and effectiveness. Such experiments are first conducted in smaller experimental settings (such as the FieldLab SmartBase discussed in the next section), before being sent out to active military exercises or even operations, if possible. The experimentation phase may include collaborations with civilian or industrial partners, allowing for smaller-scale testing and evaluation before progressing to large-scale procurement and implementation within the military. The final phase involves documenting the developed concept and releasing it to the appropriate organisational locus for implementation and adaptation. This phase ensures that the concept is effectively communicated, and necessary adjustments are made to facilitate successful integration into military practice. The goal of the CD&E process, therefore, is not the implementation of developed concepts, but the delivery of implementable concepts, fit for military practice.

The CD&E process, within a partially open innovation environment, not only aids the military in addressing the environmental impact of military operations but also provides valuable contributions beyond military contexts. Collaborations with civilian and industrial partners offer a twofold benefit. Firstly, such collaborations assist the military in mitigating the environmental consequences of its operations. Secondly, the unique nature of military capability development and the niche provided by military organisations can aid in bridging the gap between conceptualisation and solution development for civilian use of technology, potentially overcoming challenges commonly referred to as the “valley of death” in innovation. Experimental grounds, such as those in Ede, serve as examples of environments where successful collaborations and experimentation have taken place.

The CD&E process plays a vital role in incorporating novel technologies into military operations. By systematically analysing operational needs, testing potential solutions, and developing associated military concepts, the military can ensure the successful implementation and deployment of innovative technologies. The process facilitates collaborations with civilian and industrial partners, allowing for knowledge exchange and the potential transfer of technological advancements to civilian applications. The Army's phased approach to concept development and experimentation serves as a valuable framework for future innovation initiatives within the military sector, leading to enhanced operational capabilities and reduced environmental impact.

The energy transition program in the Army highlights a significant shift in the relationship between the military institution and the private and corporate sectors. In realising this transition, the private and corporate sector has become a more prominent and important actor in military capability development. This change is driven by several factors, including the recognition that the military does not possess all the necessary answers and solutions within its sphere. Instead, there is a desire to leverage existing solutions from the civil market, particularly in the context of dual-use technologies with high readiness and concept maturity levels. In the energy transition, the complexity of managing the entire supply chain and achieving goals such as reducing fuel dependency requires close cooperation with civilian partners. This represents a departure from the established norms and practices within the military context. Collaboration with civilian partners brings a different perspective and expertise, enabling the military to explore innovative and open ways of addressing societal challenges. It also aligns with the government's role of avoiding market disruption and adopting an ecosystem perspective in which the military increasingly plays a role in servicing civilian economic settings as well.

Breaking the traditional chain of procurement is another crucial aspect of this changing relationship. In developing energy transition concepts, the military actively invites external and civil partners to participate in the process. Rather than having a predefined understanding of the desired outcomes, the military is now engaging in pre-procurement collaboration to explore potential solutions. This shift is in line with the more open approach adopted by organisations such as NATO, where problem statements are published to encourage external input and collaboration.

13.3.2 The military base of the future?

In 2016, the Army's Innovation Branch initiated the "FieldLab Smart Base", which serves as a physical environment and business program dedicated to exploring and developing the concept of the "military base of the future". The Fieldlab Smartbase is a great example of an experimentation environment in which a multitude of public and private players can not only test their specific technology but also act as a platform for innovation where combinations of technologies can lead to new concepts. Located near the town of Ede, this facility enables military personnel to experiment with sustainable solutions and materials. Examples of ongoing investigations include the utilisation of solar panels, advanced energy storage systems, and geothermal energy. A fitting example of how existing solutions can contribute to the development of military concepts is the "Battery Wagon" or BaWa (Wolting, 2023). By using existing energy storage technologies (batteries) and placing these in a shipping container, similar to how diesel generators would be built, a technique called "peak shaving" becomes possible in remote locations and on military encampments. Peak shaving is about managing unexpected spikes in energy demand. The BaWa can thus function as an additional energy source when needed.

In the MoD online magazine, a commanding officer writes that since we currently know that diesel is bad for our planet, numerous alternatives are being considered to reduce the use of fossil fuels in various operations. In addition, the units currently used provide much more power than is required. By adding the BaWa, fewer generators need to be deployed in less time, because the BaWa can take over a very large part of the energy supply. This reduces diesel consumption and overall costs of energy. At the same time, the maintenance burden is automatically reduced because the generator has fewer running hours. The noise and heat signature of the unit is also reduced. According to the program manager for Energy Transition, Gerben Seevinck, the BaWa came out of an experiment with a civilian trailer and a large accumulator. Although they found that it worked on a concrete slab, something more robust was required for the battery to operate in the field. "Because that's always what we're all about," Seevinck adds, "finding as many advantages as possible for the men and women doing the operation. Well, step two was quick. Not a civilian trailer but a military trailer that could easily be put behind a four-ton truck – it could go straight into the field" (Wolting, 2023).

A high degree of energy security and an increase in readiness offers the Dutch Army an operational advantage. An additional advantage is that this battery wagon is highly mobile, and currently experiments in mobile settings are also being conducted. Trend-wise, the energy consumption of (weapon) systems (heavier, bigger, and faster), in real estate in the Netherlands and encampments in mission areas is increasing. Simultaneously, the cost of fuel is fluctuating, and reducing fossil fuel consumption is becoming increasingly important for the effectiveness of both readiness and actual operational deployment of units. While there are currently no intentions to purchase BaWa en masse, researchers have collected enough data to further develop the wagon, install solar panels, and continue to promote its usefulness in various conditions.

The BaWa is one example of reducing the carbon footprint of operational encampments (as it would in a civilian setting) and brings military advantages such as silent generation of power, a decreased need for generator backup, and less logistical pressure on the delivery of diesel. The Smart Base also facilitates collaborations between the military and civil and commercial partners, ensuring the development and provision of necessary applications. By enhancing their operational capacity, and adaptability, and reducing their ecological footprint and dependence on fossil fuels, the Dutch military aims to address the challenge of reducing the environmental impact of military operations (van der Maat, 2023).

A second example here concerns the Kitepower Project, which is a system that generates electricity by flying a kite tethered to a generator. Together with the Delft University of Technology, the system was specifically developed to be lightweight, mobile, and easy to maintain, repair, or replace (da Costa et al., 2023). Specifically, the Kitepower Falcon 100kW Airborne Wind Energy System (AWES) is being deployed within the Dutch Defence's training area near wind farm "Vader Piet" on the island of Aruba. The primary objective of this endeavour is to test the operational viability of the system as part of the military exercise Caribbean Engineer 2021. According to the developers of Kitepower, these tests mark a significant milestone for both Kitepower and the broader Airborne Wind Energy industry. It signifies the first-ever deployment of a Kitepower operation beyond the confines of the European continent and represents the inaugural utilisation of an Airborne Wind Energy system within the Caribbean region. According to the company's press release, the logistical operation provided an excellent opportunity to evaluate the system's transportation and installation advantages, reaffirming its considerable potential. Unlike the challenges encountered when transporting conventional wind turbines, such as issues related to excessive weight and dimensions, the transportation of the Kitepower Falcon 100kW AWES demonstrated its strategic capability to reach rural and remote areas using ordinary and even narrow roads. The successful completion of the entire journey with the involvement of two standard trucks, one for the Kitepower system and another for the Greener battery, further underscored the system's logistical prowess (Kitepower, 2021).

The utilisation of these systems within the framework of EU defense holds the potential to bolster the availability of renewable energy sources. This can be achieved through their integration into military microgrids, thereby contributing to the mitigation of fuel consumption, particularly concerning diesel generators, and reducing reliance on fossil fuels. Consequently, this innovative approach not only yields cost savings but also aligns with the articulated aspirations of EU MoDs in terms of greenhouse gas emissions reduction, bolstering resilience and energy security, and facilitating the alignment of the defense sector with EU objectives about energy and climate neutrality by the year 2050. Moreover, defense-related initiatives of this nature possess the ancillary advantage of expediting the advancement of novel technologies that have the potential for broader civilian applications and can facilitate the ongoing energy transition.

The collaboration between civilian industries and the military presents potential risks, such as the weaponisation of technology and the malevolent use of initially peaceful technologies. In response, the MoD states that they have implemented policy instruments, including export controls, institutional oversight, and labeling of Dual Use Research of Concern by the World Health Organisation (WHO, 2020). Moreover, the clear distinction between military operational challenges and societal challenges is becoming less feasible, with safety and security emerging as prominent societal concerns in Western society (Montgomery, 2020).

13.4 Conclusion

Recent scholarship seems increasingly concerned with how warfare impacts the environment, or how the environment is weaponised in times of violent conflict. Historians show "that weapons and armies become ever capable of creating environmental disturbances that continue to increase in magnitude, type and, perhaps, frequency" (Hupy, 2008, p. 417). Yet others – including advocacy groups – are quick to point out that preparing for war and maintaining military capacity cause environmental harm long before the actual and more visible use of the weapons of war. Indeed, building and sustaining military forces consumes vast quantities of resources and this is only likely to increase in the foreseeable future. In this chapter, we have attuned this scholarly attention to the role of the military as a climate actor. Militaries across the world increasingly recognise the important linkages between climate change, their ecological footprint, and their capacity to prevent, intervene, or otherwise respond to geopolitical tensions and conflict. We have examined how the Dutch Army aims to adhere to national goals to reduce greenhouse gas emissions by transitioning to new energy sources and solutions.

Moving beyond oil in any meaningful way remains a challenge to many industries and state institutions, and the military is no exception. Decarbonisation, however, as many also identify, is in the self-interest of state-armed actors. The tightening of international and legal regulations regarding greenhouse gas emissions, together with the increasing costs and dependency on fossil fuels as an operational vulnerability, has made it possible to imagine the reality of low-carbon warfare (Depledge, 2023). As of now, major militaries across the world, including the US, India, and China, appear to improve their energy efficiency and examine the use of new systems based on, for example, solar power. The energy transition in the Dutch Army illustrates a fundamental transformation in the relationship between the military institution and the private and corporate sectors. The increasing importance of the private and corporate sectors as a partner in realising this transition reflects a recognition that the military cannot achieve its goals alone. The shift towards collaboration, open innovation, and ecosystem thinking enables the military to tap into existing solutions, address societal challenges, and navigate the complexities of the energy transition more effectively and sustainably.

The energy transition in the Dutch Army poses several challenges that need to be addressed. These challenges can be categorised into technological, logistical, and operational aspects. Technological challenges arise from the need to adopt and integrate renewable energy technologies within the existing infrastructure of the Dutch Army. This includes transitioning from fossil fuel-based energy sources to alternative energy sources such as solar, wind, and geothermal energy. Logistical challenges stem from the requirement to establish robust and reliable energy supply chains to support military operations. The deployment of renewable energy systems, such as solar panels and wind turbines, necessitates effective planning and coordination to ensure an uninterrupted energy supply, even in remote or challenging environments. This involves addressing issues related to energy storage, transmission, and distribution to meet the power demands of military bases, vehicles, and equipment. Operational challenges emerge from the need to adapt military strategies, tactics, and procedures to account for the energy transition. The use of renewable energy sources may impact the mobility, range, and endurance of military assets. It may require new operational concepts, such as energy-efficient practices, optimised mission planning, and changes in training and doctrine. Additionally, the integration of renewable energy technologies may introduce new vulnerabilities and risks that need to be identified and mitigated to ensure the resilience and security of military operations. Financial considerations also pose a significant challenge. The transition to renewable energy technologies and the associated infrastructure investments requires substantial funding. Securing the necessary financial resources and managing the cost-effectiveness of energy transition initiatives while balancing other defense priorities can be complex.

It is also important to remain cautious here and to recognise the potential to “greenwash” military operations by foregrounding its intentions and marginal programs that aim to account for its significant environmental impact. Indeed, much of what we have discussed here is still in the early stages and has yet to be implemented on a larger scale. The question that we ultimately might see come to the fore relates to how efforts to decarbonise the military eventually impact the reality and practice of warfare altogether. Would the development and use of sustainable energy sources and weapons broaden the scope of how adversaries fight each other? Will the potential of low-carbon warfare and thus the realisation of cleaner conflicts perhaps increase the likelihood of the use of violence and aggressive strategies? These are fundamental issues, in line with a conflict studies school of thought that critically assesses whether the pursuit of decarbonisation is "simply another way of perpetuating the use of war by extending the utility of military force into a net-zero future?" (Depledge, 2023, p. 684)

Although small in terms of impact and application, the innovations and strategies discussed in this chapter demonstrate that developments in the Dutch Army are promising. It is clear how the Army could make use of new partnerships and alternative energy sources to reduce its environmental impact. As a nationally significant and politically powerful institution and polluter, the Dutch Army can be a prominent driver of a broader shift towards more sustainable energy sources. Ideally, as Middendorp (2022) points out, these efforts can eventually be scaled up to the development of more advanced materials and international collaborations and strategies. This also involves raising awareness among military personnel and politicians about the importance of sustainable energy practices and fostering a culture of energy conservation and efficiency. At the same time, training programs and educational initiatives should be implemented to ensure that soldiers and personnel are adequately equipped with the knowledge and skills to operate within the constraints and opportunities of renewable energy systems.

For now, by explicitly recognising their impact on the environment and stating the desire to reduce their carbon footprint, militaries shift away from more conventional strategies regarding ecological damage: to stay silent. The Dutch Army obviously cannot address the sizeable impact militaries across the world have on the environment on their own. Yet, the Netherlands can potentially accelerate this trend by endorsing significant changes on a European, and possibly global scale. As a NATO member state, the Netherlands can contribute to regional cooperation that aims to recognise and reduce the environmental impacts of defense expenditures and industries.

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