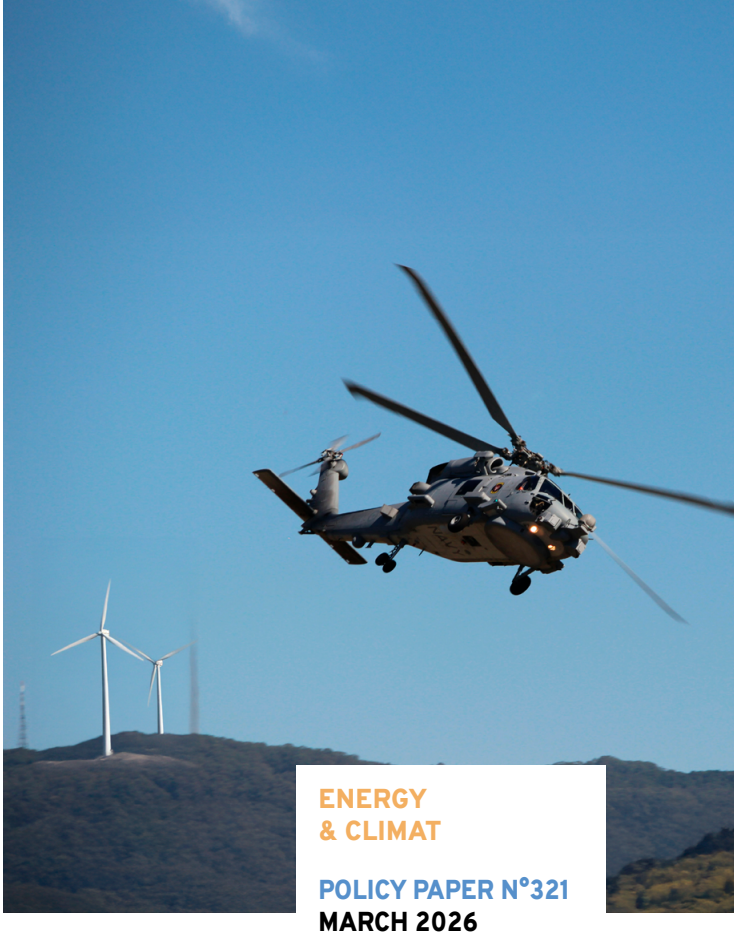

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Reconciling European Defence and the Energy Transition, Sovereignty and Sustainability:

a strategic imperative for Europeans

Introduction

From 2019 onwards, the European Union made the European Green Deal its "normative compass", structuring its policies around the objective of climate neutrality. Yet the strategic environment has since deteriorated dramatically. The invasion of Ukraine in 2022, triggered a profound shift towards an existential logic, in which security once again became the primary precondition for public action. This urgency is now embodied in the White Paper for European Defence - Readiness 2030, which sets a critical timeframe: Europe has fewer than six years to undertake a massive and coordinated rearmament in preparation for the possibility of high-intensity warfare on its own territory.

This strategic reorientation has taken place in a context of cascading crises that increasingly reveal the interdependence between security, energy and climate dynamics. The war in Ukraine exposed Europe's vulnerability to energy coercion and fossil fuel dependency. More recently, escalating tensions in the Gulf following Israeli and American strikes against Iran have once again demonstrated how quickly geopolitical shocks can disrupt global energy markets and strategic supply chains. Each new crisis reinforces the same conclusion: reconciling security, competitiveness and climate objectives is no longer a theoretical debate but an operational necessity.

Within the defence ecosystem itself, the relationship with climate issues has been complex and evolving. Military institutions were among the first to acknowledge climate change as a strategic risk capable of reshaping conflict dynamics, operational theatres and humanitarian missions. Yet the idea that defence activities themselves should contribute to carbon neutrality has been more contested, often

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perceived as secondary to operational readiness. At the same time, the defence industry has experienced the rise of sustainable finance frameworks as a significant external constraint, particularly in Europe where decades of low military spending and fragmented procurement had already weakened the financial attractiveness of the sector.

In the current context of "defence readiness", climate policy and the energy transition are therefore often relegated to secondary status, or even portrayed as regulatory obstacles that must be streamlined in order to accelerate industrial production. The Defence Readiness Omnibus initiative reflects this tendency, proposing adjustments to environmental legislation — including elements of the REACH regulation on chemicals — in order to safeguard the defence imperative.

This paper argues, however, that such prioritisation — while understandable in times of emergency — risks becoming a strategic miscalculation. Far from being a constraint, the transition towards a more sober and resilient energy model can represent a genuine operational asset. It reduces logistical dependence on fossil fuels, strengthens the autonomy of military bases through microgrids, and provides tactical advantages — including enhanced stealth — through electrification.

Europe thus faces a systemic challenge that may be described as an "incompatibility triangle" between three core imperatives:
1. **Security** – the obligation to rearm in response to the return of hard power.
2. **Competitiveness** – the need to close the technological and industrial gap with the United States and China, as highlighted by the Draghi Report.
3. **Climate** – the requirement to achieve carbon neutrality in order to safeguard the long-term sustainability of the European economic and social model.

At first glance, these three pillars appear to collide. Yet the accumulation of geopolitical, economic and environmental shocks suggests that the opposite approach is required: rather than arbitrating between them, Europe must find ways to reconcile them. The central ambition of this study is therefore to outline a pathway from an apparent triangle of incompatibility towards a triangle of complementarity.

By embedding clean technologies at the core of the European Defence Technological and Industrial Base (EDTIB), and by leveraging defence procurement as an instrument of green industrial policy, the European Union can transform apparent constraints into strategic advantages. In an era of contested globalisation and accelerating climate disruption, strategic autonomy will only be meaningful if it rests on a coherent synthesis: a credible military capability for 2030 that is inherently energy-efficient, resilient and sovereign in its energy supply.

Only under these conditions can Europe reconcile its normative ambitions with the hard realities of contemporary geopolitics.

This study therefore explores the necessary convergence between military power and the ecological transition in three stages:
1. An examination of the evolving balance between normative (climate) and existential (security) logics since 2022.
2. An analysis of the climate–defence nexus, showing how climate change reshapes military missions while opening opportunities for disruptive technological innovation.
3. A strategic roadmap setting out recommendations to transform defence procurement, optimise the European financial architecture, and integrate climate considerations as a structural variable in sovereign military planning.

I . European defence in the light of climate change and the energy transition

Over the past decade, the European Union has embarked on a far-reaching transformation of its economic and political model around the objective of climate neutrality. For a long time, European defence was in an uncomfortable position, perceived both as a separate sector that was difficult to reconcile with the emerging standards of sustainable finance, and as a blind spot in climate policies, given that its specific operational and industrial characteristics seemed incompatible with the demands of the taxonomy or the Green Deal.

Within the defence community itself, the perception of climate issues evolved along three distinct lines. First, armed forces relatively quickly acknowledged climate change as a strategic reality likely to affect security environments, operational theatres and military planning. The multiplication of climate-related risks – from resource tensions to instability in fragile regions – progressively led defence institutions to integrate climate variables into threat assessments, capability planning and scenarios of intervention.

Second, the question of the defence sector's own contribution to decarbonisation was accepted much more slowly. For many defence actors, reducing the carbon footprint of military activities appeared secondary compared with the imperatives of operational readiness and technological performance. Although a gradual shift emerged during the 2020s – with initiatives to improve energy efficiency, develop alternative fuels or green certain parts of the defence industrial base – this dynamic has been partially questioned again since the outbreak of the war in Ukraine.

Third, and perhaps most controversially, the defence sector experienced the rise of sustainable finance frameworks primarily as an external constraint. In Europe, where military budgets had been severely compressed since the end of the Cold War, the financial ecosystem surrounding defence had already been weakened by limited domestic procurement and a strong reliance on American equipment. In this context, the post-2008 "responsibilisation" of finance and the development of European sustainable finance initiatives following the Paris Agreement – notably the EU taxonomy – generated significant concern within the defence industry. Many companies feared that defence activities could be stigmatized or excluded from investment flows at a time when their access to capital was already structurally constrained.

The invasion of Ukraine in February 2022 profoundly reshuffled the deck. Defence, once often treated as a problem for sustainability, has once again become an absolute priority. This section analyses the gradual shift in Europe's centre of gravity between these two logics - normative and existential - and the way in which their ranking has changed since 2022. It shows how the climate agenda initially framed and constrained the defence ecosystem, before being rebalanced and then partially subordinated under the impact of the security emergency and the return of high-intensity warfare to the continent. Finally, it highlights the strategic tension that is currently running through the Union: should the environmental framework be simplified and made more flexible in order to speed up rearmament, or on the contrary should a synthesis be constructed in which the energy and climate transition becomes a fully-fledged pillar of defence preparedness and European strategic resilience?

I BEFORE 2022: EUROPEAN DEFENCE UNDER THE PRESSURE OF THE GREEN AGENDA

Before the invasion of Ukraine, the European strategic landscape was dominated by the normative and long-term logic of the Green Deal for Europe. This agenda, coupled with the rise of sustainable finance, exerted unprecedented pressure on the defence ecosystem, forcing it to align itself with decarbonisation imperatives for which it was neither prepared nor considered a priority. In this balance of power, the defence industry found itself in an essentially reactive position, having to justify its place in a Europe whose main project at the time was ecological.

– The rise of sustainable finance and the de facto exclusion of the defence sector

In the wake of the 2008 financial crisis, financial institutions adopted a 'respectability' agenda, setting Environmental, Social and Governance (ESG) criteria as the new paradigm. For the defence industry, this development has translated into a strategy of exclusion: the European taxonomy classifies defence companies as de facto "unsustainable" as soon as more than 5% of their turnover is linked to the military, making their financing more complicated. Many investors, who were political and concerned about their reputations, made a "moral shortcut" that revealed to be flawed: by deeming the sector intrinsically unsustainable on the grounds that weapons are used in war and therefore to destroy and kill, they confused the State's political and military responsibility for the use of armaments with the industrial activity of producing them.

This tendency has resulted in strategic choices that have had a lasting negative impact on defence companies' access to funding and, ultimately, on the strengthening of the European defence and industrial base:

- According to a Eurosif report, by 2018, 63.6% of investors in Europe were excluding conventional weapons producers from their portfolios.
- German, Belgian and Swedish banks have ceased all cooperation with companies whose defence revenues represented more than 5 to 10% of their turnover
- A number of pension funds, including the Norwegian pension fund KLP, one of the country's largest, have announced their intention to stop investing in certain companies in the sector, such as Thales, Bae Systems, Leonardo and Dassault Systems.

The European regulatory framework has inadvertently reinforced this trend. The Sustainable Finance Disclosure Regulation (SFDR), while never explicitly targeting defence, has prompted investors to be even more cautious. Indicators such as *Principal Adverse Impact* (PAI) 14, relating to "exposure to controversial weapons", have consolidated the perception of the sector as a risky liability, leading to its de facto exclusion from a growing proportion of capital.

– A regulatory framework under the hegemony of the Green Deal

At the same time, the defence industry has had to navigate a dense regulatory environment, entirely structured by the ambitions of the Green Deal. Fundamental texts such as the European Climate Law, the carbon border adjustment mechanism, the REACH regulation on chemicals and the Action Plan for the Circular Economy have built up a legislative arsenal aimed at reducing emissions in all sectors. This agenda has posed unique challenges for the defence industry. Characterised by energy-intensive processes (steel, chemicals) and complex supply chains, it has found itself confronted with standards designed without considering its strategic specificities. These dynamics have contributed to the marginalisation of the European Defence Technological and Industrial Base (EDTIB) in strategic capital flows.

– Claiming a status of "exceptionalism" despite a real awareness of the threats posed by global warming

Faced with these pressures, part of the defence community adopted a defensive stance, arguing for a status of "exceptionalism". However, this feeling of marginalisation masked a more complex dynamic, which also led to climate change being linked to the emergence of new threats and key challenges for defence actors.

From 2021 onwards, NATO was the first organisation to formalise this shift by including climate change in its security agenda. Its NATO Climate Change and Security Action Plan defines global warming as a threat multiplier: degrading infrastructure, increasing the complexity of operations, and heightening regional instability, particularly in the Arctic and in areas of state fragility. The Alliance is integrating these parameters into military planning and capability resilience, while developing a common methodology for measuring military emissions. In 2022, NATO announced a reduction of at least 45% in its own operational emissions by 2030 and set the goal of carbon neutrality by 2050[1], accompanied by a map of greenhouse gas emissions and a methodological framework made available to Member States to help them reduce their own emissions.

The European institutions followed a similar trajectory. The conclusions of the 2021 Council place the climate–security nexus at the heart of the Union's foreign policy, establishing climate diplomacy as a strategic lever designed to "take the ambitions of the Green Deal global" and calling for the systematic integration of climate factors into crisis management and security planning[2].

This orientation is also reflected operationally in the Roadmap on Climate Change and Defence adopted by the EU in 2020. It aims to adapt civilian and military capabilities to climate risks while reducing the environmental (waste management, recycling) and energy footprints of the armed forces. In particular, it provides for the collection of data on the energy consumption of Member States' armed forces, allocates dedicated funding for the energy transition (€133 million committed in 2021), and calls on Member States to draw up national plans, which some, including France and Germany, have already published.

Before February 2022 and the outbreak of the war in Ukraine, the balance of priorities clearly favoured the climate agenda. This balance, dominated by the normative logic of the Green Deal and the drive towards climate neutrality, was on the verge of colliding with the existential logic of reinvestment in defence imposed by the war in Ukraine.

I THE PIVOT OF 2022: THE WAR IN UKRAINE AND THE REBALANCING OF STRATEGIC IMPERATIVES

The invasion of Ukraine in February 2022 did not immediately cause a break with the climate agenda, but imposed a major strategic pivot in Europe: in the short term, the urgent need to expand the production of arms and munitions to sustain Ukraine's defence; and in the longer term, the imperative to rebuild Europe's own military capabilities in support of strategic autonomy, particularly in the context of an increasingly uncertain American security commitment. At the same time, the energy crisis revealed by our dependence on Russian gas has made the urgent

1 Jens Stoltenberg, *Opening Remarks at the High-Level Dialogue on Climate and Security*, NATO Public Forum, NATO, June 2022

2 Council of the EU, *Council conclusions on Climate and Energy Diplomacy - Delivering on the external dimension of the European Green Dea*l, 2021, link.

need for industrial rearmament converge with the imperatives of energy and climate security. Defence, once seen as an obstacle to sustainability, has once again become a condition of its possibility (no transition without defence and security) and vice versa, the transition to a low-carbon economy is a security and sovereignty issue.

– The Versailles Declaration: The Dual Urgency of Defence and Energy Autonomy

The Versailles Declaration of March 2022 crystallised this new balance. Adopted a few weeks after the invasion, it established a dual priority. On the one hand, it provided a strong political mandate to invest in the European Defence Technological and Industrial Base (EDTIB). On the other, it responded to the energy crisis by affirming the imperative of reducing the Union's dependence on Russian fossil fuels.

This rapprochement is not cyclical. The energy crisis revealed the structural vulnerability of a model dependent on strategic imports, while the war forced an acceleration of industrial rearmament. These dynamics have become two sides of the same sovereignty, converging towards a single imperative: securing the Union's material capacities. In this context, the energy transition ceases to be purely environmental and becomes a matter of strategic resilience.

This continuity was reflected in the Commission Communication of June 2023 on the climate-security nexus, which states that climate change and environmental degradation are risk multipliers for peace and defence (through the deterioration of existing conflicts, forced displacement, organised crime, and the weakening of states). The EU proposed an integrated approach linking climate, security, and defence, in line with the Green Deal and the Strategic Compass. These areas no longer compete with one another but instead form a single strategic horizon. The text emphasises the need to strengthen foresight analysis and early warning systems based on climate and environmental data. It also highlights the security benefits of the energy transition—particularly in terms of resilience, autonomy, and reduced dependency—as well as climate investments understood as investments in peace.

– A "Strategic Awakening" for Investors and Industrialists

The war also acted as a *wake-up call*, changing the way the defence industry is perceived. From a moral liability, it became a strategic imperative. This realignment was not just "ethical" but based on a pragmatic financial rationale. Data provided by the European Defence Agency show an increase in military spending in Europe of more than 60% between December 2021 — a few weeks before the war in Ukraine — and the end of 2024. These increases in military spending continued into 2025 — the year in which defence expenditures exceeded the threshold of 2% of European GDP and in which several states committed to a gradual trajectory towards spending levels of around 3.5% of GDP, although without a common deadline — with particularly strong growth in defence investment. Against this backdrop, European companies have seen their order books fill up, guaranteeing several years of growth and offering investors good prospects for returns on their investments. In addition, European initiatives such as the European Defence Industry Reinforcement through Common Procurement Act (EDIRPA) and the Act in Support of Ammunition Production (ASAP) acted as a "guarantee for investors that new opportunities should last over time", since the European institutions supported their rationale.

This pivot had immediate effects. As early as April 2022, the Swedish bank SEB, which had previously adopted a policy of exclusion, did an about-face, symbolising a new-found pragmatism. While 2022 marked a decisive rebalancing, the following

period saw the existential logic of defence dominate, putting on hold some of the steps taken under the Green Deal.

SINCE 2024, IN THE FACE OF URGENCY, THE SECURITY PRIORITY HAS TAKEN OVER

From the end of 2024 (Donald Trump's election and the prospect of withdrawal of American support for Ukraine and disengagement from NATO), the European Union entered the era of "*defence readiness*". This acceleration is reflected in the publication of the White Paper for European Defence - Readiness 2030, which sets out a relatively short timeframe. This document advocates massive, coordinated rearmament by 2030 to make up for decades of chronic under-investment. Competitiveness is very much present in the White Paper, and defence is explicitly conceived as a lever of economic competitiveness for the Union, even if this dimension remains subordinate to the primary objective of security. In this context, climate change is only mentioned as a threat multiplier and without mentioning either the "Green Deal" or the "Clean Industrial Deal", the document even recommends, on the contrary, to speed up rearmament, simplifying the granting of environmental permits for industrial defence projects, considering them a priority in the public interest (see the Defence Readiness Omnibus package). However, the energy transition is appearing in a roundabout way via technological research. Alternative energy sources" are cited as one of the disruptive technologies capable of transforming the conduct of war and ensuring superiority on the battlefield.

This period also coincides with a convergence of discontent with the regulatory constraints linked (or perceived as being linked) to the Green Deal, which would penalise the imperative need to catch up in terms of competitiveness, and acute threats have raised defence to the rank of absolute priority, imposing its logic of urgency on the whole of the EU's political framework.

- A convergence of strategic reports calling for a new start, but revealing a fundamental tension.

Several high-level reports have articulated the need for a quantum leap in competitiveness, defence and the fight against climate change. At the same time, they have revealed a fundamental divergence on how to achieve this, particularly in terms of the link with the climate change agenda.

The Draghi Report sounded the alarm on competitiveness, underlining that Europe is facing an existential challenge due to a persistent productivity gap with the United States. To revive growth, the EU needs to close the innovation gap, particularly in cutting-edge technologies and artificial intelligence. It estimates the effort required at almost 800 billion euros of additional investment per year. A joint plan is needed to combine decarbonisation and competitiveness, in order to reduce energy prices that are much higher than those of our competitors.

Reducing strategic dependence and strengthening the defence industry are crucial in an unstable geopolitical context. The report stresses that the fragmentation of the European defence industry leads to unacceptable dependence: between mid-2022 and mid-2023, 78% of EU defence equipment spending went to third-party suppliers. Defence is seen not just as a security imperative, but as an industrial and technological pillar essential to Europe's economic resilience, a driver of innovation and economic spin-offs.

Defence, energy transition and digital innovation must be the 3 pillars of Europe's growth strategy. The Draghi report describes defence as an "essential European

public good" (on a par with the environment) requiring massive joint funding that individual states cannot afford on their own without coordination. Furthermore, innovation in defence (new materials, AI) can have a direct civilian impact on environmental technologies and energy efficiency. For example, defence has the task of protecting energy networks, which are the target of "hybrid wars", and this is essential for the stability of a low-carbon system.

However, this convergence of analyses masks a major strategic tension, visible in the confrontation of two philosophies. On the one hand, the Defence Readiness Roadmap, focused on the urgency of rearmament, reflected a doctrinal shift by explicitly perceiving environmental regulations as potential "regulatory obstacles" to be simplified. On the other hand, the Niinistö Report offered an integrated vision, calling for "global preparedness" and asserting that climate adaptation and long-term security should not be treated as competing priorities, but as "a single resilience challenge".

This divergence represents a fundamental bifurcation: should the EU simplify its climate standards to speed up its military production, or should it build resilience in which the green transition becomes a component of its defence preparedness?

– The "Defence Readiness" Omnibus of June 2025 illustrates the legal sanctuarisation of the defence imperative.

The Defence Omnibus Package is a European Union legislative initiative aimed at simplifying, harmonising and accelerating the rules governing the European defence industry and investment in this sector. It brings together a number of Commission proposals to remove regulatory and environmental obstacles to defence production and cooperation. For example, the text proposes amending the REACH regulations on chemical substances and persistent organic pollutants (POPs). In concrete terms, it extends exemptions for the defence sector, giving explicit legal priority to "defence preparedness". Here the Omnibus treats environmental protection more as a regulatory constraint to be eased in order to guarantee the credibility of deterrence and the growing strength of the defence industrial base.

The EU must, however, "safeguard national and Union security interests" while maintaining a "high level of protection for human health and the environment". The document also identifies operational synergies between industrial efficiency and environmental management. By simplifying the rules on defence chemicals, the EU is seeking to speed up innovation cycles with a view to building a more modern and agile industrial base capable of better integrating recycling and waste management constraints.

Furthermore, the proposed regulation on the acceleration of permit-granting for defence readiness projects focuses on the industrial and administrative acceleration of rearmament, without any explicit energy or climate transition objective. It does, however, reaffirm that European environmental law will be maintained in full, specifying that accelerated procedures will not reduce environmental standards and that requirements relating to water, biodiversity, habitats, air, waste or ecosystems will remain fully applicable.

Environmental protection is not abrogated but subordinated to an imperative of strategic preparation. The Omnibus thus establishes a hierarchy in which security becomes the organising principle of the European legal framework.

This internal shift has been powerfully accelerated by the uncertainties surrounding US support for Ukraine and the questioning of the US security umbrella. The need to prepare for high-intensity threats on its own became the final catalyst for this rearmament.

In the space of a few years, the balance of power between the normative and existential logics has been decisively reversed. The security emergency has taken precedence, adapting the regulatory framework to serve the defence imperative. However, this hierarchical approach cannot negate the physical reality of climate change. **The central question for Europe's strategic autonomy is therefore no longer *whether* defence preparedness is a priority, but *how* it will be achieved: by putting its normative project in brackets, or by a radical synthesis that would make sustainable industry the very backbone of its strategic resilience**. This reconciliation, which involves identifying obvious synergies, will be the subject of the next part of our analysis.

II • Climate and defence, two interconnected challenges

For a long time, military security and the climate transition have been treated as separate - or even competing - priorities, yet they appear to be deeply intertwined. **Climate change acts as a threat multiplier, destabilising operational environments and weakening critical infrastructures.** But at the same time, the way in which governments conceive their defence effort - their technological, industrial, energy and budgetary choices - can accelerate or slow down the ecological transformation of economies.

For Europe in particular, faced simultaneously with a major geopolitical shock and the imperative of climate neutrality, the challenge is no longer to choose between security and climate, but to understand how to articulate these two strategic agendas. The increase in military spending underway since 2022 represents both a budgetary challenge and a structuring opportunity: it can exacerbate tensions between political priorities, or on the contrary become a lever for innovation, resilience and energy sovereignty.

This section explores the many dimensions of the climate-defence nexus: firstly, by analysing how climate change is profoundly transforming military missions and capabilities; secondly, by identifying possible synergies between climate resilience and operational efficiency; and thirdly, by showing how, under certain conditions, defence can become a driving force for industrial and energy transformation on a European scale.

I THE CLIMATE/DEFENCE NEXUS: WHEN CLIMATE CHANGE IMPACTS DEFENCE POLICY

Climate change is no longer a marginal concern for the defence sector, but a structural factor impacting its missions, capabilities and sustainability. The recognition of this reality by leading organisations such as the United Nations (UN) and the North Atlantic Treaty Organisation (NATO), as well as by strategic and defence players in several countries, led by the United States, marks a major strategic turning point in the last 20 years. The interaction between climate and defence can be seen in four interdependent dimensions that are redefining the paradigms of contemporary security.

– Climate as a threat multiplier

The concept of "threat multiplier" was popularised by a report published by the US Department of Defense in 2007. Adopted by NATO in 2021, it is the cornerstone of modern strategic threat analysis. It postulates that global warming is not just an isolated threat, but an aggravating factor that exacerbates political instability, the scarcity of essential resources such as water and food, and forced migrations, thereby significantly increasing the risk of instability and conflict throughout the world.

Quantitative data confirms this correlation: a study published in 2024 shows that a 1°C rise in temperature is associated with an increase in interpersonal violence of around 2% and an increase in the risk of inter-group conflict of between 2.5% and 5%. This relationship can be observed on all scales, from local to global, with Africa being the most sensitive zone, with an estimated temperature rise of almost 4 degrees. Global warming also acts as a geopolitical transformer: the accelerated melting of the Arctic, which could become seasonally ice-free before 2050, would open up new shipping routes and intensify strategic competition between major powers in a region hitherto locked in by the ice. Attempts to conquer new territories, such as Greenland, which has recently been in the news, could increase, even between countries that were previously allies.

The main global risks identified by strategic analysts, such as failure to adapt to climate change, natural disasters, loss of biodiversity and large-scale involuntary migration, are now inextricably linked to national security issues. In addition to instability and conflict, these risks could lead to an increase in HADR (humanitarian assistance and disaster relief) operations, particularly in exposed regions such as hurricanes in the Caribbean, drought in sub-Saharan Africa and flooding in East Asia as explained by a RAND Europe study published in 2020.

– Direct impact on operational capabilities

In addition to its role in accelerating geopolitical crises, climate change is having a direct impact on the operational capabilities of armed forces through its extreme physical manifestations. For example, temperatures above 45°C reduce air density, making it harder for helicopters to take off and reducing their carrying capacity. Similarly, the risk of overheating of sensitive electronic equipment, both on board aircraft and in ground facilities, is becoming a major concern that can compromise operational availability. The impact is also human: the heat is already reaching the physiological limits of soldiers, with British training restricted from 20-25°C, while the degradation of certain terrains is reducing access to sites, as in California, where coastal erosion and rising waters could cause 50 to 77% of military training beaches to disappear, thereby reducing operational readiness.

In addition, infrastructures such as military bases, essential support points for external operations, are increasingly exposed and vulnerable. The melting permafrost in Arctic regions, coastal erosion, flooding and the intensification of storms pose a direct threat to the integrity of infrastructure, whether coastal or inland. The US Department of Defense (DoD) adaptation plan already highlights the need to reinvest billions of dollars to rebuild damaged infrastructure. In the UK, for example, the vulnerability of national bases and permanent overseas operating bases is also recognised as a growing risk. A facility's critical systems (electricity, water distribution, heating, ventilation, air conditioning, telecommunications) are all under threat, with potential consequences ranging from simple disruption to complete paralysis of operations.

– Critical energy dependency

Defence's heavy dependence on fossil fuels, and in Europe's case on imported fossil fuels, is a major strategic vulnerability. In 2023, the EU's dependence on energy imports still amounted to 58.4% of its primary energy, making it one of the most energy-dependent regions in the world, in contrast to the United States, a net producer. This dependence exposes European forces to major strategic vulnerabilities such as supply disruptions, energy coercion or hybrid attacks targeting critical infrastructures, such as the sabotage of the Nord Stream 1 and 2 gas pipelines in the Baltic Sea in September 2022, a few months after the start of the war in Ukraine.

Military aviation illustrates the extent of this dependence. In modern armed forces, between 70% and 85% of total energy consumption in operations is accounted for by liquid fuels (paraffin, diesel, jet fuel), and military aviation accounts for the lion's share of this consumption . During the first Gulf War in 1991, for example, American forces consumed in a single day the equivalent of around four times the daily consumption of Poland at that time. Furthermore, the modernisation of military equipment has tended to increase energy consumption. A paper published by the European Union Institute for Security Studies (EUISS) in June 2025 notes that a modern fighter aircraft such as the American F-35 consumes approximately 60% more fuel than the F-16 it replaces. Such logistical dependence would be an Achilles heel in a high-intensity conflict.

– The carbon footprint of the armed forces

The carbon footprint of the military sector reveals a profound tension at the heart of contemporary power: the instrument designed to guarantee security simultaneously contributes to the climate instability it will have to manage in the future. This contradiction is not just symbolic; it is also material. On a global scale, the armed forces account for around 5.5% of greenhouse gas emissions (roughly comparable to the share of global emissions produced by the European Union as a whole). If this sector were a country, it would have the fourth largest carbon footprint in the world. A study by the British NGO Scientists for Global Responsibility estimates that, if all NATO members were to reach 2% of GDP in military spending, the additional cumulative emissions between 2021 and 2028 could approach 2 billion tonnes of CO_2e—more than Russia's current annual emissions.

I SYNERGIES TO FIGHT THE CLIMATE AND MILITARY BATTLES HEAD ON

Far from being opposites, the objectives of climate resilience and military superiority can be mutually reinforcing. The energy transition, often perceived as a constraint, can in fact become a lever for operational efficiency and strategic autonomy in a number of ways. Although there are limits, notably the long-life cycles of equipment, which slow down the adoption of new technologies, the benefits of immediate and gradual action are undeniable.

– Strengthening resilience and strategic autonomy

As a direct response to the vulnerability of infrastructures and energy dependence mentioned above, the adoption of clean technologies ('cleantech') directly strengthens the resilience of armed forces and Europe's strategic autonomy. The deployment of local renewable energy sources (solar, wind), smart micro-grids and advanced battery systems on military bases helps to ensure energy self-sufficiency. In the United States, for example, the *Department of Defense* is actively developing microgrids on its bases, with the aim of equipping all its facilities by 2035. These military microgrids strengthen the energy resilience of bases by enabling them to

operate autonomously in the face of disruptions to the national grid. This capability is crucial to protect against cuts in civilian networks: in 2020, US bases suffered more than 3,000 unplanned service interruptions, 97% of which were energy-related, demonstrating the fragility of conventional infrastructures. Microgrids and local production also reduce dependence on fuel convoys, historically a major target in conflict zones, while limiting the thermal and acoustic signature of installations.

This capability is crucial in protecting against civil network outages, whether accidental or caused by hybrid or cyber-attacks. By generating their own energy on site, military installations can maintain the continuity of their critical operations (communications, radar, weapons systems) even in the event of a major crisis.

– Easing the logistical burden

Dependence on fossil fuels represents a logistical "ball and chain" that exposes forces during operations. A 2009 study by the Army Environmental Policy Institute highlighted the vulnerability of fuel supply convoys, citing U.S. military data indicating that, during the conflicts in Iraq and Afghanistan, a fatality occurred on average for every 24 fuel convoys. The integration of low-emission technologies — such as hybrid vehicles or hybrid power systems (HPS) combining renewable energy sources with conventional generators — can significantly reduce this logistical burden. This translates into lower human risk, reduced reliance on long and fragile supply chains, and an overall enhancement of operational resilience.

– Gaining tactical advantages in terms of performance and stealth.

Electric or hybrid platforms, with their silent mobility, reduced heat signature and operational gains, illustrate how the energy transition can produce direct tactical benefits for armed forces:

- Energy efficiency gains will reduce the quantities of fuels that need to be transported and protected, particularly fossil fuels. These troops and resources can then be allocated to other responsibilities.
- This reduction in dependence on fossil fuels protects defence budgets against volatile energy prices while enhancing self-sufficiency.
- Electric platforms can improve platform stealth and acceleration power and reduce the need for technical support for mechanical parts. They can also be (partially) remotely manoeuvred when integrated with automation.
- In the event of an attack, an electric platform or vehicle presents less risk of leaks and fuel spills polluting the battle site.

More generally, the war in Ukraine already illustrates this highly electrified battlefield: military superiority is now based on energy-intensive systems (sensors, electronic jamming, anti-drone defence, communications networks) whose performance depends on energy availability and resilience.

This approach is not new in military history. As early as 1955, with the entry into service of the USS *Nautilus*, nuclear propulsion of submarines - and then aircraft carriers from the 1960s onwards - profoundly transformed naval strategy by offering virtually unlimited endurance, thus responding to a quest for autonomy that was already central during the Cold War. Today, hybrid propulsion for surface ships follows a similar logic, improving stealth and reducing the frequency of refuelling at sea.

– Improving budget efficiency

Investing in energy efficiency is not only an ecological imperative, but also a powerful lever for savings. By reducing the consumption of fuel and other resources, armed forces can make substantial savings in the long term, which can then be reallocated to enhancing combat capabilities.

It is also an industrial lever: Europe holds around 60% of the world's high-value patents in low-carbon fuels, but its production capacity still lags behind its technological lead. Investments such as REPowerEU (more than 200 billion euros devoted to renewables, energy efficiency and domestic infrastructure) are aimed at reducing dependence on fossil fuel imports. Although originally civilian, these investments create an effect of scale that lowers the cost of advanced energy technologies and facilitates their adoption by defence. In the UK, the Ministry of Defence accounts for around 50% of central government's greenhouse gas emissions, which has led London to integrate the green transition not only as a climate imperative, but also as a lever for building future capabilities and optimising the use of public resources.[3]

I THE STRATEGIC OPPORTUNITIES CREATED BY THE ENERGY TRANSITION AND CLIMATE NEUTRALITY

These synergies demonstrate that the transition to climate neutrality, far from being a burden, opens the way to wider opportunities where it becomes a driver of innovation and modernisation for the whole defence system in order to strengthen the European technological and industrial base.

– Breakthrough technological innovation

The decarbonisation dynamic is accelerating the development of cutting-edge technologies that are likely to radically transform defence capabilities. Synthetic fuels, hydrogen and small modular reactors (SMR) are currently the most structuring areas.

- Synthetic fuels (e-fuels) and hydrogen: These technologies offer the prospect of dense, storable, locally produced energy with a simplified logistics chain using only electricity and water, guaranteeing strategic independence from global hydrocarbon markets. Manufacturers such as Rheinmetall are already exploring e-fuels as a way of ensuring a reliable and autonomous supply, as their production requires only electricity (ideally renewable), water and CO2 captured from the air.
- Small Modular Reactors (SMR): a decarbonised and reliable back-up solution to supplement intermittent renewable energies on military bases. They would provide complete energy autonomy by disconnecting from the national grid, while offering the possibility of producing other strategic resources such as hydrogen or drinking water. The US Department of Defense's PELE project, which aims to develop a mobile nuclear microreactor, is a pioneering example of this trend.
- Electrification, a possible asset in terms of stealth, which is a decisive multiplier of operational superiority: reducing its signature means shortening the enemy's detection time, lengthening the enemy's decision-making cycle and preserving tactical initiative. From the Lockheed F-117 Nighthawk to the Lockheed Martin F-35 Lightning II, informational dominance is based first and foremost on control of radar, infrared and acoustic signatures. In this respect, electrification offers a strategic lever: electric or hybrid propulsion greatly reduces the thermal signa-

3 https://www.gov.uk/government/publications/ministry-of-defence-climate-change-and-sustainability-strategic-approach/ministry-of-defence-climate-change-and-sustainability-strategic-approach-accessible-version?utm_source=chatgpt.com

ture compared with combustion engines, while reducing mechanical noise. Conventional submarines with anaerobic propulsion, such as the Type 212, already illustrate the extent to which electric propulsion enhances underwater acoustic discretion. On land, the U.S. Army's hybrid demonstrators show that an electrified vehicle can silently approach an area of operation in "silent watch" mode. Eventually, the integration of advanced batteries, distributed electrical systems and directed energy weapons will further strengthen this convergence between energy transition and tactical advantage. So, electrification is not just a climate imperative: it is becoming a direct vector of operational sovereignty.

– The circular economy to secure supplies

Applying the principles of the circular economy to defence (reuse, recycling, regeneration) is an effective strategy for extending the life of equipment and, above all, for securing access to the critical raw materials on which Europe is heavily dependent. Several concrete examples already illustrate this approach: in Portugal, the sustainable modernisation of F-16 fighter jets includes the recovery and re-use of materials for future fleet maintenance. At the same time, in the Netherlands, the Ministry of Defence has introduced a circular system for the management of uniforms and personal equipment, to reduce waste and extend their lifespan.

At European level, at the end of 2021, the European Defence Agency (EDA) created a framework, the Incubation Forum for Circular Economy in European Defence (IF CEED), to apply the "circular economy" approach to the defence sector. This initiative is based on a community involving the defence ministries of the EU Member States, the European defence industry, research and technology bodies, financial institutions and academia. After a successful first phase leading to the incubation of more than a dozen ideas for collaborative projects, the Forum has entered its second phase of action ("IF CEED 2", 2023-2027).

– Modernising infrastructures

The trajectory towards climate neutrality requires the armed forces to modernise buildings and infrastructures that were largely designed for the climatic and energy conditions of the 20th century. Bases, barracks, ports and airfields must now be made resilient in an environment marked by +2 to +4°C warming, an intensification of extreme events and increased volatility of energy supplies.

Energy renovation to high performance standards - often in line with national or European 'Net Zero' targets - has a double strategic dividend. Firstly, it significantly reduces the defence sector's carbon footprint and energy dependency, thereby contributing to public climate commitments. Secondly, it improves the quality of life and working conditions of personnel (thermal comfort, air quality, energy reliability), making military careers more attractive and retaining talent.

I DEFENCE AS A DRIVER OF THE CLIMATE TRANSITION

While climate change is transforming defence, the movement is not unequivocal. Military investments can, in turn, become a structuring lever for the energy transition on an economic scale. Paradoxically, a sector that has historically been one of the most dependent on fossil fuels has considerable leverage, especially today: with its budgetary weight, purchasing power and tradition of technological innovation, defence can steer entire sectors and accelerate industrial change that goes well beyond the military framework.

This reflection is all the more necessary given that, in the European public debate, the resources devoted to defence and those devoted to the climate are often presented as competing. The geopolitical context is currently leading European countries to significantly increase their military budgets; some see this as a trade-off against climate investments. But this opposition is partly misleading. The sums mobilised to strengthen European security can - and must - be designed to support the continent's energy transformation. Provided that coherent climate and industrial objectives are integrated into procurement, research and capability planning policies, defence spending can help consolidate strategic sectors that are useful for the transition.

In addition to the operational synergies already highlighted between climate resilience and military efficiency, massive investment in defence and military innovation can also produce technological externalities beneficial to the energy transition and adaptation to climate change. The history of dual-use technologies is a reminder that many innovations from the defence sector - from satellite systems to advanced materials, power electronics and certain energy storage solutions - have subsequently found their way into the civilian economy. In the current context, the efforts being made in the electrification of platforms, synthetic fuels, resilient microgrids, storage technologies and low-carbon materials could, under certain conditions, accelerate useful industrial dynamics well beyond the military field.

So, rather than systematically opposing defence spending and climate spending, we need to analyse the conditions under which part of security investments can contribute, directly or indirectly, to the energy transformation of economies.

– The role of "lead market" for green technologies

Even if military research no longer accounts for the dominant share of the global innovation effort, the procurement budgets of defence ministries remain decisive. In many European countries, they are one of the main public purchasers of complex industrial goods.

As such, procurement choices can play a role as a "lead market" by creating massive and early demand for emerging low-carbon technologies. By including environmental criteria in calls for tender — green steel, low-carbon cement, sustainable fuels, resilient energy systems — the armed forces can help these technologies reach industrial scale, speeding up cost reductions and facilitating their diffusion throughout the civilian economy. While such a lead-market effect does not necessarily require production to be located within the European Union, it could be significantly strengthened if accompanied by mechanisms favouring European industrial capacity. Integrating environmental criteria with a form of European preference in defence procurement would reinforce the industrial spillovers sought, supporting both the development of domestic clean-technology supply chains and the strategic autonomy of the European Defence Technological and Industrial Base.

In a context where Europe is simultaneously seeking to strengthen its defence industrial base and secure its critical supply chains, this orientation can also support strategic industrial autonomy.

– Technological spin-offs for the civilian sector

History shows that military research has produced innovations with systemic effects for the civilian sector, such as GPS or the Internet. This "spin-off" model can be replicated in the context of the energy transition. Military investment in cutting-edge fields such as advanced energy storage or energy management using

artificial intelligence (AI) to optimise consumption on bases could have a direct impact on improving the resilience of civilian electricity grids.

The increasing porosity between the civilian and military spheres - illustrated by the "spin-in" dynamics, where civilian technologies such as Starlink are adopted by the armed forces - reinforces this potential for cross-innovation. In an environment of global technological competition, the efforts made to achieve operational superiority can thus produce systemic benefits for Europe's energy transition.

– Support for industrial conversion

The increase in defence budgets in Europe comes at a pivotal time for several industrial sectors faced with decarbonisation. The need for equipment and infrastructure that is compatible with increased environmental requirements can provide a strategic outlet for the conversion of existing industrial capacity.

The production of hybrid or electric military vehicles, the development of more energy-efficient on-board energy systems, and the manufacture of components for resilient electrical networks can mobilise expertise from the automotive, metallurgy and energy engineering sectors.

Rather than opposing defence industrial policy and climate industrial policy, a coordinated approach would make it possible to preserve jobs, maintain critical skills on European territory and simultaneously strengthen the defence industrial base and energy sovereignty.

– Protecting biodiversity on military land

Vast areas of military land, often untouched by urban development and intensive agriculture, are unexpected ecological assets. If managed sustainably, they can become significant carbon sinks and refuges for biodiversity. The example of the 'no-mow' initiative at Westdown Camp in the UK to encourage pollinating insects illustrates this potential. In fact, the UK Ministry of Defence is now the largest owner of Sites of Special Scientific Interest (SSSI) in England, surpassing even organisations dedicated to nature conservation.

Despite this remarkable potential for convergence, strategic approaches to integrating climate into defence vary considerably, particularly between the United States and Europe, which calls for an in-depth comparative analysis.

Conclusion • From compatibility to strategic integration

This study began from a simple observation: since 2022, the European Union has shifted from an architecture dominated by the normative primacy of the Green Deal to an existential logic of defence readiness by 2030. This shift in the strategic centre of gravity has generated a structural tension between three imperatives: security, competitiveness and climate.

Yet a detailed analysis of the climate–defence nexus shows that this tension is not inevitable. Climate change acts as a threat multiplier, degrades infrastructure and exposes Europe's structural energy dependence. At the same time, however, the energy transition creates tangible operational opportunities: reducing the logistical burden, strengthening the resilience of military bases through microgrids, enhancing stealth through electrification, and driving dual-use innovation that can reinforce the European Defence Technological and Industrial Base (EDTIB).

The European "problem" is therefore not a lack of synergies, but their insufficient strategic integration.

The 2028–2034 Multiannual Financial Framework (MFF) changes the scale of the debate. With €131 billion allocated to defence, security and space, €23.3 billion to industrial decarbonisation, and nearly €155 billion to Horizon Europe, the EU is no longer merely juxtaposing priorities — it seeks to finance them simultaneously. The creation of a European Competitiveness Fund, merging fourteen existing programmes, marks a significant institutional shift: it establishes a single entry point capable of directing investment towards strategic, dual-use and low-carbon technologies.

However, budgetary convergence does not yet amount to doctrinal convergence. In the absence of explicit conditionalities, the risk remains that of an energy-neutral rearmament — greater in scale, but not necessarily more resilient.

On this basis, the study advances three strategic recommendations:

1. **Establish a European "Climate Security Readiness" standard.**

Such a standard would systematically reintegrate climate risk into capability planning, harmonise the assessment of vulnerabilities affecting military infrastructure, and embed energy autonomy requirements from the earliest stages of platform and systems design.

This is not about "greening" defence. It is about recognising climate change and the energy transition as fully-fledged variables in sovereign military planning. This implies a common methodology for assessing climate risks to military infrastructure, the integration of energy performance and autonomy requirements into platform design and harmonised data collection on emissions and energy vulnerabilities.

The current financial framework makes this qualitative shift possible without treaty reform, notably by leveraging the "clean transition" and "dual-use infrastructure" budget lines to systematically strengthen the energy resilience of critical military capabilities.

2. **Turn defence procurement into a low-carbon industrial lever.**

A share of European funding and acquisitions should be made conditional on criteria relating to energy resilience, supply-chain decarbonisation and circularity, in order to avoid technological lock-in over the next 30 to 50 years.

Within the next MFF, the European Competitiveness Fund could become the key interface between the EDTIB and Europe's industrial transition. To achieve this, a proportion of industrial funding should be tied to credible decarbonisation trajectories. Dual-use technologies (energy storage, microgrids, synthetic fuels, low-carbon materials) should be explicitly recognised as strategic priorities. Eligibility criteria should favour European low-carbon supply chains.

The objective is not to subordinate defence to climate policy, but to prevent long-term technological lock-in that would undermine Europe's energy sovereignty.

3. **Secure strategic value chains.**

Aligning the objectives of Defence Readiness 2030, industrial policy, critical raw materials management and circularity would simultaneously reduce external dependence, energy vulnerability and carbon exposure.

With public procurement representing roughly 14% of EU GDP, defence procurement can serve as a powerful "lead market" for strategic technologies. Introducing criteria related to energy resilience, circularity and the security of critical raw materials would reduce external dependencies, stabilise industrial value chains and foster the emergence of an integrated European cleantech–defence ecosystem.

The 2028–2034 MFF makes this strategic alignment materially feasible. It can remain a budgetary framework that merely juxtaposes military and climate priorities. Or it can become a genuine instrument of European sovereignty, grounded in the convergence of military power, energy resilience and industrial autonomy.

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