

# IMPULSE

A WHITE PAPER FROM VINCORION ON ENVIRONMENTAL PROTECTION AND MILITARY



## WHAT YOU NEED TO KNOW ABOUT GREEN DEFENSE

The importance of climate action is increasing – including in the defense sector.  
Part 1: Politics, armed forces and industry must find solutions together.



**Kajetan v. Mentzingen**  
 Managing Director  
 at VINCORION

## CLIMATE CHANGE FROM THE PERSPECTIVE OF SECURITY POLICY

The last few years have shown us, as if under a magnifying glass, that we are facing existential challenges throughout society. Climate change is one of the issues that also has an impact on the defense industry.

It is estimated that military forces account for more than five percent of global carbon emissions today. When it comes to Germany, the figure is lower. But while data is at least being collected in this country, estimates have to be made for many others. And this figure doesn't include the direct effects of war, such as destroyed houses and fuel depots, damage to forest areas, explosives, or even reconstruction.

### Making military applications more environmentally friendly and climate-friendly

In this white paper, we would like to address key aspects of sustainable defense, both from a scientific perspective and from that of the nations that are committed to "green defense." We will explain what the implications of climate change are from a security perspective. And finally, we would like to present solutions that already exist today – and that help make military applications more environmentally and climate friendly.

I hope you find the information in this white paper both interesting and informative. Enjoy the read!

Kajetan von Mentzingen



## Climate Change and the Security Situation

# SECURITY ALSO DEPENDS ON THE CLIMATE

Climate change is becoming a security threat – to the European continent itself as well as to Europe's strategic interests. "The question is how armed forces can help mitigate climate change, such as by reducing their greenhouse gas emissions and contributing to decarbonization goals." This is the question raised by researcher Ben Barry, who has initiated a study on "green defense" for the International Institute for Strategic Studies (IISS).

As Barry notes, a stable climate is an essential security interest for all European countries, the EU, and NATO. We are familiar with the forecasts that extreme weather events will become more frequent – i.e., that the number of storms, floods, heat waves, and droughts will continue to increase. The impacts are nearly impossible to quantify, and range from the water supply to reductions in agricultural productivity. Governments need to keep pace here – otherwise there is a risk of “political instability” developing.

And this, in turn, contributes to a greater risk of armed conflict. The IISS cautions that there could be “increased competition” for minerals and raw materials needed for technologies to combat climate change. In regions that play an important role in Europe’s security, the risks to political stability are increasing, such as in parts of Africa or the Middle East. Mass migration has already developed into an international crisis. As such, climate change is “acting as a conflict accelerator.” One consequence is that at the moment, the deployment of European forces abroad is declining, as the example of the withdrawal of the German armed forces in Mali shows. Such deployments could become more likely again, however.

**CLIMATE MANDATES FOR EUROPEAN DEFENSE**

But are the causes of climate change, i.e., carbon emissions, actually being properly tracked? At the present time, reporting specifically on military emissions is not mandatory in many countries. IISS experts believe that this will have to change – especially as extreme weather events increase and the need to reduce emissions grows.

The European Climate Law sets a target of zero greenhouse gas emissions by 2050. This includes reducing emissions by at least 55 percent from 1990 levels by 2030. To achieve this, the member states must make sound plans. With respect to Europe, the major challenge is decarbonizing armed forces without disarming them.

At least **55 %**  
emissions reduction  
by 2030.

The EU has produced a climate and defense roadmap. This includes the European Defense Agency’s (EDA) Energy and Environment Program. NATO has climate policy goals as well, and already adopted a “Green Defense Framework” back in 2014. Then, in 2021, it laid out a climate strategy to reduce greenhouse gas emissions by 45 percent by 2030 and reach net zero by 2050. NATO aims to become “the leading international organization in understanding and adapting to the security implications of climate change.” The German armed forces also want to reduce their emissions to zero by 2045 as part of the Germany’s Federal Climate Change Act. In its latest sustainability report, it presented approaches to achieve this (see page 5).



The German armed forces also want to reduce their emissions to zero by 2045 as part of the German government’s climate protection law.

**NATO'S APPROACH TO GREEN DEFENSE**

Since the military operations in Afghanistan and Iraq, it has become clear that fuel replenishment is one of the major challenges facing military forces – the safety of the troops and operational flexibility depended on the supply, writes Kristian Knus Larsen of the University of Copenhagen in the study “Unfolding Green Defense.” Precisely because deployed forces had to be stationed on the ground for longer periods of time and were using highly sophisticated technology, fuel consumption increased. To reduce the number of costly and complex convoys needed for resupply, the United States Army, for example, and the Marine Corps in particular, sought to reduce fuel consumption. That is why fuel consumption is one of the four challenges to the

concept of green defense. Another is the reliability of the energy supply – this can falter if energy is obtained from unreliable sources, such as Germany from Russia. But according to Larsen, climate change and its accompanying effects are also among the problems that a green defense approach must address. The fourth issue is defense spending – since the 1990s, many NATO countries have cut their defense budgets, including Germany, as is well known. This was a trend that is only now changing (for example in the context of the “Zeitenwende” in Germany). The cost of energy consumption, which was supposed to fall, came under the scrutiny of planners in NATO countries early on. NATO formulated its approach to green defense based on these four security challenges:

**WHAT IS GREEN DEFENSE**



According to the IISS, some NATO countries are skeptical about whether the military alliance should pay so much attention to climate change. They see it as a departure from the core mission of territorial defense. What is clear to the IISS, however, is that even if NATO cannot solve the problem of climate change, it can ensure that the alliance adapts.

This includes NATO’s standardization programs, for example. This will establish interoperability between the different nations’ military forces. Logistical standardization will ensure that ammunition and fuel from different nations can be used. But as new fuels and energy sources are developed, NATO must also adapt its standardization programs. There is a great deal of “wiggle room” in this regard.

**WHAT ARE NATO COUNTRIES PLANNING TO DO TO MITIGATE CLIMATE CHANGE?**

The NATO countries’ military forces are tackling the issue of climate change in different ways. Their responses range from comprehensive strategies, such as the United Kingdom’s, to individual mentions of climate change, to not even mentioning it by name at all. However, most European and North American countries recognize the need for an “energy transition” in the defense sector as well.

In this context, there are certain goals that are more easily achievable, such as increasing energy efficiency in buildings, electrifying the fleet of nontactical vehicles, installing renewable power sources, or in the context of training.

# FROM GREAT BRITAIN TO CANADA: STRATEGIES AND MEASURES

The Dutch “Energy and Environment Strategy for the Defense Sector” and the “Action Plan for the Energy Transition in the Defense Sector” set targets for reducing the use of fossil fuels. This includes reducing dependence on fossil fuels by 20 percent by the year 2030 and by 70 percent by 2050 (from 2010 levels), as well as generating 50 percent of energy from renewable sources by 2030 and achieving energy self-sufficiency by 2050.

**Energy self-sufficiency**

until 2050



until 2025  
**energy-autarkic**

field camp



France’s “Energy Strategy for the Defense Sector 2020” also addresses climate risk. Energy efficiency requirements are finding their way into procurement programs. These involve the hybridization of powertrains for ground vehicles, biofuels for aviation, and optimizing the use of energy in the marine sector. The French Army plans to build a hybrid demonstrator of a multi-purpose armored vehicle dubbed “Griffon” by the year 2025 and is working on developing an energy-autonomous field camp in its “Eco Camp 2025” project. Pilot training includes simulations designed to teach fuel-efficient aircraft operation.

The British Ministry of Defence has so far conducted the most thorough investigation of how the defense sector can achieve an energy transition and contribute to net-zero targets. The ministry has set a goal of achieving net-zero emissions by 2050. The Royal Air Force has even set itself more ambitious targets, aiming to become carbon neutral by 2040.

**Net-zero-emissions**

until 2050



**-40% emissions**

in infrastructure  
and light commercial  
vehicle fleets  
by 2030



Canada also has strategies in place – these seek to reduce greenhouse gas emissions from infrastructure and light-duty vehicle fleets by 40 percent by the year 2030. The focus here is on improving energy efficiency, procuring clean energy, modernizing the vehicle fleet, and increasing energy independence.

The Slovenian Ministry of Defense is pursuing ambitious goals through its “Slovenian Energy and Environment Partnership in Defence” – aiming for 40 percent of its energy to come from renewable sources by the year 2030. In this context, it plans to make its properties and vehicle fleets greener.

**40%**

of energy from renewable sources



## Defense energy strategy

for an energy-oriented mentality



Italy also has a “defense energy strategy” to promote an “energy-oriented mentality.” Numerous other national energy and environmental strategies for the defense sector have similar goals, including those of Denmark, Finland, and Greece.

Sweden has launched a project entitled “Fossil-Free Armed Forces by 2045” which aims to achieve national “net-zero targets.” Among other measures, tests were conducted with a 50/50 blend of biofuels in JAS 39 Gripen aircraft engines, and the results were encouraging.

## Fossil free forces

until 2045



The German Ministry of Defense’s agenda is to make the armed forces climate neutral by 2045. Various policy papers list the planned measures, such as increasing supply reliability in field shelters. Synthetic fuels are also being tested. The Ministry is working to electrify its nonmilitary vehicle fleet and promote sustainable construction and energy use at military facilities. The efforts are summarized in a sustainability report.

## Electrification and Synthetic fuels



Similarly, the Austrian Ministry of Defense is procuring electric vehicles for nonmilitary purposes, increasing energy self-sufficiency at facilities, installing solar power systems, and promoting environmental and energy awareness among personnel.

published  
**2 approaches**



Efforts are underway within the United States Department of Defense to address climate change. The Department has published a plan called the Defense Climate Risk Analysis and Climate Adaptation Plan. A second set of measures focuses on climate change mitigation strategies and is titled Sustainability Report and Implementation Plan.

## Photovoltaics and Electric vehicles





## DEFENSE WITHIN NATIONAL "NET-ZERO" TARGETS

Do the armed forces' climate strategies fit in with other national goals? Are these commitments legally binding? So far, under the 2015 Paris Agreement on climate change, tracking military emissions has been voluntary.

There is a risk that the issue will not receive the attention and funding it needs if defense policymakers see it as a secondary priority. This could lead to many missed opportunities for synergies, warns the IISS.

The fact is, according to the IISS, that most European countries have not yet established a sufficiently concrete strategy for the defense sector with respect to mitigating climate change, let alone specific targets. The EU and NATO could accelerate their work in this area. ■

## THE IISS BELIEVES THAT THESE MEASURES ARE WARRANTED:

- Climate change mitigation and adaptation plans need to be developed for the defense sector in NATO member countries.
- These plans will need to be coordinated with the countries' other climate change programs.
- A database for carbon emissions in the defense sector must be introduced.
- Policymakers and government agencies must provide support for the transformation of the military.
- According to the IISS, however, climate action should also serve to improve military effectiveness,
  - for example by reducing the "logistical footprint"
  - and through the security of supply lines.
- Research on sustainable technologies in the defense sector needs to be intensified.
- There needs to be greater cooperation between the defense industry and the civil sectors of the industry.



The Industry's Contribution

# WE SUPPLY THE EQUIPMENT FOR SYSTEMS THAT REDUCE EMISSIONS

The defense industry in Germany is already working on climate and environmentally friendly solutions in some areas. The technology company VINCORION offers innovative energy solutions for the aerospace and defense industry.

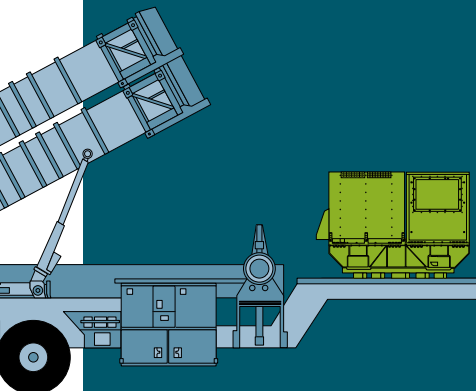
“When it comes to energy, our focus is on environmentally friendly power generation. Using our technical solutions, we can help armed forces reduce their carbon footprint,” says Managing Director Kajetan von Mentzingen. At the company’s German sites in Wedel, Altenstadt, and Essen, roughly 700 employees work on innovative solutions that increase the efficiency of the products with respect to sustainability and environmental friendliness. “We, as a company, would welcome more concrete climate targets,” v. Mentzingen makes clear. “This is because we can provide equipment for systems that support achieving these types of goals.”

Modern energy systems can reduce emissions in the defense sector, for example in vehicles such as the LEOPARD 2 main battle tank or the PUMA infantry fighting vehicle. VINCORION supplies components for these vehicles’ power system, among others.

The engineers believe it would be possible to cut carbon emissions significantly if all optimization measures were fully exploited, including efficient engine design below maximum power, hybridization, and the use of external energy sources. Depending on the vehicle’s capability profile, hybridization could also reduce the size of the diesel engine and thus achieve further reductions in carbon emissions.

## HYBRID ENERGY SYSTEM WITH CLEAR TACTICAL ADVANTAGES

VINCORION technology enables savings in costs and logistics



	PATRIOT™ Launcher Standard Generator	PATRIOT™ Launcher Hybrid Generator	Improvement
Data (MTBF Interval*)	750 hours	3000 hours	+ 400 %
Maintenance / Repair	91 hours	11 hours	- 88 %
Consumption in 24h	82 liters	43 liters	- 48 %
Consumption in 24h (batallion)	72 times	24 times	- 66 %

Source: VINCORION calculations

\*MTBF: Mean Time Between Failures



Up to 33 percent of CO<sub>2</sub> emissions can be reduced in the energy supply for air defense systems.

#### A NEW GENERATION OF GENSETS

The environmental compatibility of the larger gensets is also being fine-tuned – VINCORION supplies units with an output of up to 200 kilowatts. “We manufacture the power supply for air defense systems, such as ‘IRIS-T’ and PATRIOT™. And we offer a new generation of gensets that are used in these systems. But we are also developing these for the German armed forces to supply power for deployable or mobile, vehicle-integrated use,” says Kajetan v. Mentzingen.

State-of-the-art diesel engines serve as the basis for these units. Interfaces allow electrical energy storage modules to be integrated, as well as sustainable energy sources such as solar power systems. “We calculated our new equipment’s carbon footprint reduction potential. When used to power air defense systems, we can cut carbon emissions by 33 percent,” says v. Mentzingen. The power supply is available in different performance classes.

A hybrid power unit for the PATRIOT™ launcher system with 15 kilowatts of power requires 1.8 liters of diesel per hour. In comparison, the nonhybrid legacy system consumed 3.4 liters per hour. This means it’s possible to set up a protective shield against rockets in an even more environmentally friendly way.

#### SQUEEZING THE MOST VALUE OUT OF EVERY LITER OF FUEL

As Kajetan von Mentzingen explains, “we’ve made it our mission to squeeze the most value out of every liter of fuel.” Reducing fossil fuel consumption not only lowers costs and cuts emissions, it also reduces dependencies – on energy sources located outside Europe, for example.

But it also offers opportunities to optimize operations and the logistics chain in the field. When fuel consumption is reduced, less fuel is needed.

Transporting diesel is often a weak point in the supply system. The less fuel that’s needed, the less time soldiers spend in harm’s way.

This is because, in the event of a conflict, VINCORION’s gensets could eliminate more than a third of the required fuel convoys, which would then no longer be targeted by the enemy.

“Our goal at VINCORION is to focus on energy and environmentally friendly power generation,” v. Mentzingen emphasizes. “As a market leader in energy systems for air defense, we can draw on over 30 years of experience. No matter what climate change mitigation goals the defense sector is aiming to achieve, our technical solutions will put customers on the path to climate neutrality.” ■

With our technical solutions, customers are setting out on the path to climate neutrality.

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