Climate change and defense in the European Union: progress towards a greater integration

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Executive summary

Since 2008, the European Union (EU) has shown interest in addressing the multiple security challenges created by climate change. At first, these risks were faced exclusively under the diffuse perspective of considering climate change as a threat multiplier. However, over the past few years, there have been political and legislative developments within the EU to address the influence of climate change more accurately on security and defense, both from an adaptation and mitigation standpoint.

Climate change is altering the strategic, tactical, and operational environment in which the armed forces operate. In turn, adaptation and mitigation policies that are part of the EU's climate agenda condition defense planning, both in the operations of the armed forces and in the development of their capabilities, investments, and acquisitions.

This policy paper presents the path that the EU is following to converge the security and defense agenda and the EU climate agenda. In this way, the nexus between climate change and security and defense is being addressed within the EU from a more proactive and multidimensional perspective.

After studying the actions being taken by the EU concerning the impact of climate change on defense and security, the following recommendations can be made:

a) Aligning the security and defense agenda with the climate agenda allows for concrete actions to be taken to address climate change-related risks both domestically and internationally;

b) Climate change will have repercussions at all levels of society and in all sectors of the economy, for this reason, systemic change is needed;

c) It is necessary to strengthen the resilience of the armed forces in the context of climate change and develop military capabilities aligned with climate objectives without losing operational capacity;

d) Climate change is altering the scenarios of action of the armed forces so that an adaptation of the missions will be required, to offer a response to natural disasters, operate in new conflict environments or face variations in the ecosystems in which they are deployed;

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e) The preparation of strategic documents that address the impact of climate change on defense allows the establishment of the necessary framework for the development of adaptation and mitigation policies at the strategic, tactical, and operational levels within the armed forces;

f) To carry out these policies, it is essential to improve climate, environmental, and emissions data collection systems to support decision-making;

g) In peace and security agendas, environmental degradation must also be considered as a component linked to the negative impacts of climate change;

h) As the risks of climate change are global, it is necessary to establish new formats of cooperation and dialogue with international partners with whom security and defense interests are shared.

KEYWORDS
Climate change; Defense; Green Deal; Green Defense.

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1. Introduction

In 2007, the UN Security Council held its first debate on climate change and its implications for international security. In response to the commitment and leadership position in the fight against climate change, the European Union began to take an interest in the relationship that climate change could have in the emergence of conflicts. The document "Climate change and international security" published in 2008 can be considered the beginning of the EU's interest in deepening the relationship between the two factors.

In the following years, climate change has slowly been incorporated into the security agendas of both the EU and international organizations such as the UN or NATO. Initially, climate change was treated as a threat multiplier, mainly in those countries vulnerable to its effects, with intrinsic security problems and a lack of governance.

However, in recent years there has been a deepening study of the impact of the relationship between climate change, security, and defense from the adaptation and mitigation standpoint.

From the adaptation standpoint, climate change generates direct physical risks that affect geography, ecosystems, critical infrastructures, and military bases and facilities. But also indirectly, climate change increases the risk of geopolitical instability, mainly when it comes to the management of shared water resources or access to raw materials necessary to carry out the energy transition towards clean technologies.

Regarding mitigation, globally, the armed forces contribute to the emission of greenhouse gases ranging from 1% to 5% of global emissions (Rajaeifa *et al.*, 2022). According to a recent study, cumulative emissions in 2019 from the defense sectors of EU members are equivalent to approximately 24.8 million tons of CO2 (Parkinson and Cottrell, 2021).

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For security reasons, the armed forces have been exempted from meeting climate commitments. But this trend has changed. The fight against climate change is producing systemic changes in society and it is increasingly unsustainable for the armed forces to remain oblivious to this reality. Therefore, a new approach is being established within the EU to involve the defense sector in meeting the mitigation objectives set out in the Green Deal[2]. Achieving the EU's climate commitments set out in this agreement will not be possible without progress in the decarbonization processes of the defense sector and the armed forces.

This approach to decarbonization has received a major boost as a result of the war in Ukraine. The search for greater strategic autonomy and greater energy resilience have become priority objectives for the EU.

The Russian invasion of Ukraine is altering patterns of external energy dependence on the EU, as Russia has ceased to be the main supplier of energy products to the EU. This situation has generated a very volatile scenario in the energy security of the European Union. At present, very rapid changes are taking place in energy dependencies and in the search for alternative sources where solar, wind, and green hydrogen are experiencing a great boom. In this scenario, the involvement of the energy sector in the study of the nexus of climate change and defense is now the focus of the EU's attention.

2. The European Green Deal was adopted in 2020. It is a package of policy initiatives aimed at putting the EU on the path to a green transition, with the ultimate aim of achieving climate neutrality by 2050.

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To respond to this complex scenario, the EU is betting on a convergence between the climate agenda and the security and defense agenda. The article presents the main advances that are being made in this regard.

2. Climate change and defense risks

The relationship between climate change and military activities is bidirectional (Scott and Khan, 2016). Like the rest of society, the armed forces have to face the negative impacts associated with climate change. This involves carrying out adaptation measures at the strategic, operational, and tactical levels. On the other hand, the defense sector is a major emitter of greenhouse gases and thus contributes to global warming. Establishing mitigation actions in this sector has become an obligation. European society is deeply aware of the problem of climate change, and it is increasingly difficult to maintain the exclusion of member countries' defense departments in meeting climate objectives.

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Climate change is a complex environmental problem that affects all components of human security, sometimes directly and sometimes indirectly (Vivekananda, 2022). Therefore, the relationship between climate change and security is multifaceted. As the study of this relationship moves forward and attempts to address it from more concrete perspectives, it is concluded that climate change has very important repercussions on the defense sector and the armed forces.

Although climate change is global in nature and does not affect all nations equally, direct, and indirect risks to the defense sector can be established generically.

The increasingly severe and frequent direct effects of climate change such as floods, storms, heat waves, sea level rise, and droughts can directly and indirectly affect the facilities, capabilities, and operations of the armed forces. Sometimes these facilities may suffer slight interruptions, but at other times they can cause serious damage with the consequent paralysis of the infrastructures necessary for national security[3]. Armed forces' support to civil authorities in disaster situations will become more frequent in the future and it will also be necessary to adapt capabilities to new changing environmental situations such as, for example, rising sea temperatures, which may influence ships' flotation systems, or water stress situations that may involve personnel and equipment maintenance.

In addition to these risks associated with the direct effects on defense structures and capabilities, climate change is considered a threat multiplier since it contributes to fostering or aggravating situations of instability or conflict, especially in those regions that are fragile and vulnerable.

Climate change and environmental degradation can lead to situations of food and water insecurity that can lead to the fight for natural resources, migrations, or the promotion of adherence to terrorist groups[4]. Examples of these situations are frequently found in the Sahel region where the European Union has a special interest due to its geographical proximity.

In addition to these increasingly known and studied risks from the academic-political field and international relations, climate change is associated with geopolitical risks that will be of greater importance in the future. First, global warming is facilitating the commercial exploitation of areas of the planet that remain inaccessible to humans. The Arctic is the clearest example of this new situation that risks becoming a new space for confrontation. The armed

3. For example, the intense heatwave of July 2022 caused the runway at the Oxfordshire base to melt. The Royal Air Force had to use alternative airfields.

4. The loss of livelihoods of the population due to situations of water scarcity and food insecurity is used by terrorist groups to recruit personnel, offering them food and money, as well as a new means of subsistence.

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forces of the countries will have to adapt to be operational in the harsh weather conditions of this region.

Secondly, the decarbonization of economies is the fundamental pillar on which the fight against climate change rests. Reducing greenhouse gas (GHG) emissions requires changing energy models based on fossil fuels into models in which renewable energies have a greater weight in the energy mix of countries. However, to carry out this decarbonization and electrification of societies, mineral resources such as lithium and cobalt or rare earths elements are needed, whose deposits and supply chains are currently more concentrated than fossil fuel deposits. China's high dependence on the supply of these materials considered strategic has set off alarms in Western powers by observing that much of their energy transition depends on the availability and accessibility of these mineral resources[5]. On the other hand, the mining boom may aggravate the climate crisis due to its increasing impact on deforestation (Giljum *et al.*, 2022).

Third, water use in contexts of climate change also poses significant geopolitical challenges. The increase in the construction of hydroelectric projects as support for decarbonization can generate conflicts between the hegemonic powers and the countries with which they share the basins. So far, water has been a catalyst for cooperation, but in a water scarcity scenario it can become a source of tension.

The potential for increased frequency of droughts to negatively affect hydropower generation is a growing risk. It is estimated that between 61% and 74% of hydroelectric power plants will have generation problems due to lack of water (Opperman *et al.*, 2022).

To all these risk scenarios that link climate change to security, and defense, must be added the growing interest that the EU and NATO have shown in establishing mitigation policies within the armed forces. To contribute to the national climate goals of reducing greenhouse gases, member countries of both organizations are undertaking initiatives, policies, and legislative developments to seek greater involvement of the defense sector in the fight against climate change. With this, it is possible to ensure that the operational effectiveness of the armed forces is not affected.

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3. From the Climate Change and Defense Roadmap to the Strategic Compass

The EU is moving decisively towards greater involvement of the defense sector in climate issues. The message is clear: Don't waste time. It is essential to prepare the armed forces of EU member countries for all possible scenarios, taking into account the effects of climate change, the volatile energy security scenario, and geopolitical uncertainty (Tavares da Costa, Krausmann, and Hadjisavvas, 2023). Therefore, adaptation and mitigation actions will condition defense planning in the future, both in the operations of the armed forces, as well as in the development of their capabilities, investments, and acquisitions.

In November 2020, the European External Action Service (EEAS) published the "Roadmap on climate change and defense of the European Union ("EU Climate change and defense roadmap"). This document, which falls under the Common Security and Defense Policy (CSDP), was the first EU policy framework to address the links between defense and climate change within the broad nexus between climate change and security. The plan highlights the operational dimension to improve knowledge of the risks associated with climate change, early warning, and strategic forecasting, as well as the integration of climate change and environ-

5. The extraction of mineral resources can also bring environmental problems that can aggravate the climate crisis. In the Amazon, for example, illegal mining is directly linked to deforestation, which is the activity responsible for much of Brazil's greenhouse gas emissions.

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mental aspects in the planning and execution of civil and military missions and operations framed within the CSDP. This Roadmap is the key document that develops climate action from the standpoint of EU security and defense.

Regarding capacity building, the Roadmap establishes as main actions: addressing the new challenges of climate change, ensuring that military equipment remains effective in external weather conditions, and the search for more energy-efficient technologies for missions and operations of the armed forces of member countries. It also addresses reducing energy demand and increasing the energy resilience of the armed forces and their infrastructure in Europe and the application of new technologies and practices that will reduce the carbon and environmental footprint of the defense sector.

The Roadmap also highlights the importance of building strategic partnerships through diplomatic outreach in multilateral forums that address climate change implications and advocacy, while highlighting the EU global leadership in this regard. Since its publication, this Roadmap has received support from other EU institutions and member countries. Subsequently, a series of strategic documents have been published that deepen and expand aspects of the relationship between climate change, security, and defense.

In October 2021, the EEAS presented the document "Concept for an Integrated Approach on Climate Change and Security", which complements the Climate Change and Security Roadmap. This document constitutes the strategic framework for approximating the impact of climate change and environmental degradation across the EU's external peace and security action. It also provides an important integrating element since it considers that the nexus between climate change, environmental degradation, and security must be addressed in a complementary and coherent way with climate policies such as the Green Deal, the EU Climate Change Adaptation Strategy approved in 2021 or the EU Biodiversity Strategy for 2030.

To see the degree of implementation of the Roadmap and this Concept, the EEAS and the Security and Defense Policy Committee have to issue evaluation reports detailing the concrete actions that have been taken to comply with the provisions of both strategic documents. The first report was published in October 2022 and includes the actions carried out from 2020 to 2022.

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In line with these initiatives, the EU Strategic Compass for Security and Defense, adopted in March 2022, is a definitive endorsement to align climate issues with the security and defense sector and vice versa. This political-strategic document recognizes that climate change is a factor of insecurity and instability and that, therefore, climate resilience and neutrality are important for the security and defense of the EU. As detailed in the document, EU member countries should fully implement the EU Climate Change and Defense Roadmap and enhance the capacity of the armed forces to support civilian authorities in emergency situations. To advance these goals, the document requires member states to develop a national strategy on how they intend to address the impact of climate change on the armed forces. These strategies will have to be developed by the end of 2023. There are no unique formats, and each country can elaborate it according to its uniqueness. In the case of Spain, the Ministry of Defense developed this strategy in July 2023, while France, for example, had already published it in April 2022.

The Strategic Compass has also set a goal for all military missions and operations to have an environmental advisor and report on their environmental footprint by 2025. This requirement demonstrates that environmental degradation is also being implicitly included when addressing the nexus between climate change and security and defense.

In line with what was agreed in the Strategic Compass, on June 28th, 2023, the EU High Representative for Foreign Affairs and Security and Defense and the European Commission issued a joint communication entitled: "A new outlook on the climate and security nexus", which offers a new integrative approach. This communication identifies thirty actions within four objectives

- Strengthen planning and decision-making by analyzing reliable and accessible data on the climate-safety nexus. That first step is crucial because it ranges from climate science data to military emissions data.

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- Operate the climate-security nexus in EU external action, including crisis management. That is, materialize the strategic documents in concrete actions with the designation of funds, if necessary.

- Improve the climate mitigation and adaptation measures of the security and defense forces of the Member States in their operations and infrastructures.

- Establish new formats of cooperation and dialogue with international partners such as the UN, NATO, the African Union (AU), the League of Arab States, and the Organization for Security and Cooperation in Europe (OSCE).

"In this context of strengthening the link between climate change and defense, the European Commission and the EU High Representative for Foreign Affairs and Security are planning to carry out civil and military initiatives so that the objectives of the Strategic Compass and the European Green Deal converge. Among these initiatives is the launch of a new climate and defense support mechanism formed by the European Commission, the EEAS, and the European Defense Agency (EDA), to identify gaps, barriers and promote collaboration between countries."

In this context of strengthening the link between climate change and defense, the European Commission and the EU High Representative for Foreign Affairs and Security are planning to carry out civil and military initiatives so that the objectives of the Strategic Compass and the European Green Deal converge. Among these initiatives is the launch of a new climate and defense support mechanism formed by the European Commission, the EEAS, and the European Defense Agency (EDA), to identify gaps, barriers and promote collaboration between countries. It is also intended to establish a "Competence Centre on Climate Change, Security and Defense" to improve the climate adaptation and mitigation effort of the armed forces of the Member States.

This collaborative environment within the EU is a formula that works. In fact, the network of experts from Member States' Ministries of Defense that was formed as a follow-up to the Strategic Compass at the initiative of the EEAS and the European Defense Agency (EDA) has proven to be a useful format for fostering cooperation, coordination, and the exchange of best practices, as expressed in the aforementioned joint communication.

4. The Green Deal and the defense of the EU

As described in the previous section, since the approval of the "Climate Change and Defense Roadmap", the institutions related to the EU defense sector have made a firm and decisive approach to the issue of climate change.

The European Green Deal proposed by the European Commission in 2020 sets binding targets to reduce GHG emissions by at least 55% by 2030 and achieve climate neutrality by 2050 compared to 1990 emissions. The defense sector is a large emitter of greenhouse gases, and these objectives can hardly be achieved without greater involvement and effort in the mitigation of the armed forces.

In February 2022, the European Commission published the communication "Commission contribution to European defense" which describes its plans and initiatives to contribute to European defense, boosting innovation and addressing strategic dependencies. With this proposal, the Commission established the need to create a policy framework to reduce energy demand, increase the energy resilience of critical technologies, and develop concrete climate-resilient solutions. It also suggested exploring the potential to improve the impact of energy-related directives on military infrastructure.

According to the "European Electricity Review 2023" report, in 2022, wind and solar energy generated 22% of the EU's electricity, surpassing gas for the first time. This boost that renewable energies have experienced has been achieved thanks to the granting of aid and subsidies granted by European funds.

With the war in Ukraine as a trigger, the European Commission presented the RePowerEU plan, with which it proposes to increase the binding energy efficiency target from 9 to 13%,

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and the "Fit for 55" package, which implies a 55% reduction in emissions by 2030 and an increase in the renewable energy target for that same year, from 40 to 45%.

In this context, some European Union defense ministries, although they had already established decarbonization and energy efficiency policies, have committed to reducing greenhouse gas emissions. For example, France has committed to achieving a 40% reduction in emissions by 2030 compared to 1990 levels, and a 40% reduction in fossil fuel consumption by 2030 compared to 2012. Germany has committed to achieving a 40% reduction in emissions compared to 2030. The Netherlands has committed to achieving 50% self-production of energy from all military facilities by 2030, self-sufficiency by 2050, and a 20% reduction in greenhouse gas emissions by 2030 and 70% by 2050 compared to 2010 levels.

The European Defense Agency (EDA) is working in collaboration with EU Member States to collect data on their armed forces' energy use and greenhouse gas emissions. At present, the Agency intends to establish a structured methodology called "Defense Energy Suite" (DEneS) in order to create a single interface that will represent the energy consumption of the EU Ministries of Defense and the status of energy and environmental related activities/policies.

"Tackling decarbonization in the defense sector without compromising the operationality of the armed forces poses numerous challenges but also offers opportunities."

Tackling decarbonization in the defense sector without compromising the operationality of the armed forces poses numerous challenges but also offers opportunities. Within the framework of the EU Strategic Compass for Security and Defense, the report "Impacts of climate change on defense-related critical energy infrastructure" has been published. The importance of this report lies in the fact that a broader approach to the nexus between climate and security has been established by considering the energy aspect of the armed forces to give an inclusive vision. It also stands out for its proactive approach in considering that the impacts of a climate disaster or crisis on energy infrastructures can be significantly more costly than preventive action, in addition to unpredictable consequences for the security of the EU.

This report assesses the impacts of climate change on defense-related critical energy infrastructure and structure. It identifies options to strengthen climate resilience and multinational collaboration in defense, while contributing to EU efforts towards climate neutrality by 2050. All this with the aim of moving towards reducing the climate footprint and increasing the sustainability of the armed forces.

It also provides scientific evidence to support the development of national strategies to prepare the armed forces for climate change, in line with the Strategic Compass and, at the same time, align the defense sector with the European Union's energy and climate neutrality goals for 2050.

"Among these changing and disruptive factors, it should be mentioned that access to certain materials and minerals, essential for the energy transition, is of great concern in the EU. For this reason, it is also necessary to address the geopolitical challenges that exist to ensure the safe and sustainable supply of these materials when analyzing the nexus between climate and defense from an energy standpoint."

According to this report, military facilities, and capabilities, and therefore the defense of the European Union, must be prepared for all changing and disruptive energy scenarios, and the armed forces can demonstrate leadership in this transition as the European Union moves towards an energy union.

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The high concentration in certain countries, the high dependence on foreigners, and the remoteness of supply chains can jeopardize the achievement of climate objectives. Without a secure and sustainable supply of critical raw materials, there will be no ecological and industrial transition. For this reason, the EU, like other Western powers, is reorganizing its supply chains of materials considered critical for the energy sector, such as lithium, cobalt, or rare earths elements. The "Critical Raw Materials Law", approved in March 2023, will provide the EU with the necessary tools to guarantee access to a safe and sustainable supply of these essential materials, to carry out the transformation towards a green and digital economy.

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Part of the solution to avoid excessive dependence on critical materials from the outside and optimize the use of resources is to promote circularity. The "Circular Economy Action Plan", approved in 2020, is a central part of the Green Deal. It aims to boost resource recycling, reduce waste levels, and, as a priority, reduce Europe's dependence on imported strategic materials and components.

The trend toward circularity of the European economy has direct implications for the European defense industry, which needs to become greener to reduce its environmental impact while strengthening Europe's strategic autonomy. The EDA is working closely with the Commission through a new 'Circular Economy Forum' to generate cooperative project ideas for Member States geared towards more circular advocacy. Within this Forum, the circular economy is treated as a "systemic change" that requires all sectors to transform and start the transition towards this economic model.

5. Conclusions and recommendations

"Through different initiatives, strategic documents, and EU legislation, a scenario of convergence between climate policies and strategic defense is being created."

The EU's security, defense, and climate agendas tend to converge to approach the nexus between climate change and security and defense from a more proactive and multidimensional position. Through different initiatives, strategic documents, and EU legislation, a scenario of convergence between climate policies and strategic defense is being created.

From an adaptation standpoint, climate change impacts can directly and indirectly affect defense facilities and the structure, readiness, and effectiveness of armed forces. Climate change is also causing changes in the military's performance scenarios, both at the national level and in missions abroad. Therefore, the climate component must be fully integrated into the EU's conflict prevention and crisis management toolkit.

Given that climate change will have repercussions at all levels of society and in all sectors of the economy, climate change adaptation measures must also be systemic. Military planning has to take all these changes into account. For this reason, it is necessary for the defense ministries of EU member countries to develop a strategy to address the influence of climate change at the strategic, operational, and tactical levels for all possible scenarios.

"Given the complexity of the relationship between defense and climate change, it is useful to create national and international multidisciplinary dialogue structures that contribute to deepening knowledge on this subject for its subsequent application both from the point of view of adaptation and mitigation."

From a mitigation standpoint, the defense sector also faces significant challenges. Achieving the EU's climate commitments set out in this agreement will not be possible without progress in the decarbonization processes of the defense sector and the armed forces. The development of military capabilities aligned with climate objectives without losing operationality are some of the challenges that the defense ministries of the member countries must face. In this scenario, the involvement of the energy sector in the study of the nexus of climate change and defense is now the focus of the EU's attention.

Proper risk management can reduce the damage caused by climate warming in the defense sector. For this, obtaining reliable environmental and emissions data is essential to be able to establish adequate mitigation and adaptation policies in the defense sector.

Given the complexity of the relationship between defense and climate change, it is useful to create national and international multidisciplinary dialogue structures that contribute to deepening knowledge on this subject for its subsequent application both from the point of view of adaptation and mitigation.

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