MINISTÈRE
DES ARMÉES

Liberté
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CLIMATE & DEFENCE STRATEGY

APRIL 2022

GENERAL INTRODUCTION

Climate change amplifies risks and threats and is already affecting international peace and security. The acceleration of global warming will exacerbate tensions of all kinds, which could lead to open crises or even conflicts. This will increasingly affect the international strategic context as well as mission conditions and the capabilities of the armed forces, which play an essential role in defence, peace-keeping and crisis management.

The French Ministry for the Armed Forces has developed a comprehensive "Climate & Defence" strategy to prepare the defence tool for the climate challenge. It is based on strengthening the Ministry's organisation in terms of knowledge and anticipation of strategic climate change issues and the implementation of an ambitious adaptation policy by all the armed forces, directorates and departments.

The Ministry contributes to environmental protection, particularly in the maritime domain within the framework of "State action at sea", as well as to the achievement of European and national mitigation objectives. It intends to pursue and further this contribution.

Cooperation is an integral part of the strategy across the board. It involves reinforcing interministerial consultation and must also take place in a broad international context.

Implementation of the Climate & Defence strategy must be based on a level of strategic coordination and general policy direction in order to federate and engage all of the Ministry's stakeholders in a comprehensive approach structured around four main focus areas:

- Developing knowledge and the ability to anticipate the strategic challenges associated with climate change;
- Initiating a process to adapt the defence tool to predictable disruptions caused by climate change;
- Continuing the Ministry for the Armed Forces' contribution to collective efforts for mitigation and the energy transition;
- Stepping up cooperation on the defence issues of climate change within the Ministry and at the interministerial and international levels.

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1. A HOTTER AND MORE UNSTABLE WORLD

While global warming has been around 1.1°C on a global scale since the end of the 19th century, the phenomenon is accelerating and the Intergovernmental Panel on Climate Change (IPCC) now anticipates that it will reach 1.5°C around 2030 and 2°C by the mid-century. According to the IPCC's RCP8.5 scenario – the most pessimistic, but which corresponds to current trends – global warming could be between 3.3°C and 5.7°C by the end of the century if the international community fails to take drastic measures to reduce greenhouse gas emissions.

1.1 Strong impacts of climate change on human societies

An acceleration of global warming

While the consequences of current global warming are already being severely felt around the world, there is reason to be concerned about and to prepare for the security and strategic consequences of a rise in temperatures that would be two or three times higher over the next fifty years.

that is disrupting the environment and the weather

The climate crisis is leading to slow and gradual environmental transformations, such as ocean warming and rising sea levels, ocean acidification and deoxygenation, the aridification of certain regions as a result of changes in rainfall patterns or the emergence and spread of infectious diseases. It is also the cause of sudden violent changes in nature as shown by the increasing number and intensity of extreme weather events such as heatwaves, torrential floods, coastal flooding and cyclones. According to the World Meteorological Organisation, their number has increased fivefold over the past fifty years.

and heightening tensions on resources as well as migratory phenomena

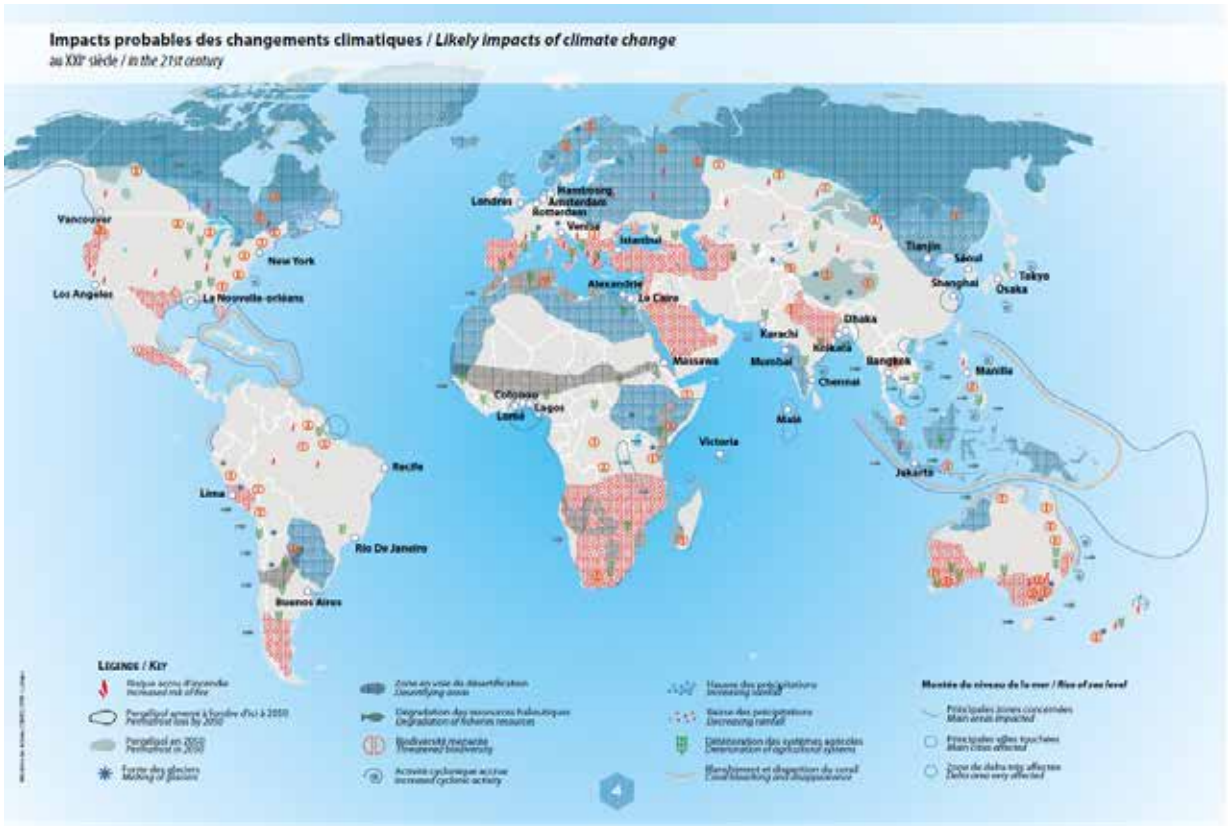
The climate crisis is already affecting human security around the world, and more severely so in fragile and developing countries even though they have contributed little to greenhouse gas emissions so far. These effects differ depending on the geographical and climate context in the region and the political and economic capacity for resilience of governments. It puts pressure on water and food resources for which competition is double – both for access to natural resources and for their use. This in turn heightens domestic and international tensions. The climate crisis is expected to make some regions uninhabitable and constitutes a vital challenge for certain low-lying island countries, particularly in the Indian and Pacific Oceans, provoking population displacement or international migrations. It also affects the national territory, in mainland France and overseas.

1.2 A major issue for international peace and security

The climate crisis affects international peace and security

Climate change acts as an amplifier of risks and threats worldwide, affecting international peace and security. Many countries, including France, are in favour of the United Nations Security Council taking up the issue. Although no conflict today can be attributed to the climate crisis alone, it has already contributed to heightened tensions that have led to the outbreak of violence, domestic crises or conflicts.

Consequently, the importance of the climate factor will also increase for the armed forces which are essential players in managing crises and maintaining peace and security at both the national and international levels.



1.3 A Ministry highly committed to "green defence" for the past 20 years

The ministry contributes to the government's mitigation objectives

As they come to realise the consequences of the climate crisis, governments today are implementing mitigation and adaptation strategies. In its National Low Carbon Strategy (SNBC, March 2020), France thus committed to reducing its greenhouse gas emissions by at least 40% between 1990 and 2030 and to becoming carbon neutral by 2050. The French energy and climate strategy aims to lead France towards a carbon neutral society prepared for the effects of climate change. These strategies rely particularly on standards designed to limit the impact of human activities on the climate. The Ministry for the Armed Forces aligns its actions with these standards and contributes to achieving the government's objectives.

A strong commitment to "green defence"

For fifteen years, the Ministry for the Armed Forces has been firmly committed to protecting the environment and to contributing to the energy transition, taking action in line with public sustainable development policies. The term "green defence" covers measures that contribute to controlling and reducing the impact of defence institutions on the environment and, for some of them, to combating climate change through mitigation measures.

and to environmental protection operations

The armed forces take part in many operations both on national soil and abroad, which contribute to protecting the environment, particularly as part of State action at sea, that represents nearly a quarter of the operational activities carried out by French naval force ships. The armed forces' participation in the interministerial operation Harpie, which fights against unlawful gold mining activities that destroy forests in French Guiana, is another example of the armed forces' contribution to protecting the environment, including biodiversity.

1.4 It is now necessary to implement a comprehensive climate security policy that helps "win the war before the war"

Adapting to climate change is a large-scale, long-term project for the armed forces, which must be taken into account in defence policy

The climate crisis is gradually changing the international strategic context and affects both the missions and operational capabilities of armed forces. For the armed forces to be able to continue providing policymakers with adapted military options and retain their full abilities to perform operational contracts, they must anticipate these changes and adapt accordingly. The Ministry therefore considers that climate change affects the five strategic functions defined in the French White Paper on Defence and National Security. Future studies, particularly with a view to the next French White Paper on Defence and National Security and French Military Programming Law, should fully take these effects into account.

This project affects all of the armed forces' levels of action and capabilities and requires a comprehensive response

The climate crisis represents a major factor of change as regards strategy, operations and tactics which must be taken into consideration by the Ministry for the Armed Forces in all of its areas and environments of intervention, be it operations, force employment doctrine, organisation, human resources, equipment, support or operational preparedness. All of the ministry's organisations are concerned and are able to contribute to the Climate & Defence Strategy.

The phrase "climate security" thus encompasses all issues related to the impact of climate change on the strategic context and geopolitical balances, the missions of the armed forces and their means of implementation, as well as the resulting anticipation and adaptation measures.

to contribute to the ability of the armed forces to complete their missions

The ability of the armed forces to serve France rests on their ability to respond anytime, any place and under any circumstances to defend the nation. Through their energy-saving and innovation efforts in particular, the armed forces actively contribute to the collective effort towards the energy transition. However, the Ministry must continue to assert the requirements of its mission to protect France's interests and its freedom of action.

1.5 Three major challenges to meet

The main defence issues related to climate change facing the Ministry of the Armed Forces include:

- managing the consequences of climate change on the armed forces' missions and capabilities;
- ensuring the resilience of defence infrastructure in France and abroad;
- integrating the specificity of the sovereign defence mission into collective mitigation and energy transition efforts – and the legal norms associated with them – so that they do not impact the operational performance and superiority of the forces.

1.6 Ministry-wide coordination for a comprehensive approach

In order to take a comprehensive approach, the Ministry must have a tool for coordinating its actions covering knowledge and anticipation, mitigation, adaptation, and interministerial and international cooperation.

A strategy developed in the context of the EU and NATO climate strategies

The Ministry's commitment is made in the context of the European Union's Roadmap on "climate change and defence" adopted in January 2021 and a "Climate Change and Security Action Plan" approved by NATO in June 2021. This requires active participation by the Ministry in this work in all relevant areas. Moreover, the Strategic Compass adopted in March 2022 by the Council of the European Union provides that all Member States will develop national strategies by the end of 2023, with the aim of preparing armed forces for the climate crisis. The Climate & Defence Strategy also meets this common objective.

To address the defence and security challenges brought by climate change, the Ministry's strategy structures its action around four main focus areas :

1. Developing knowledge and the ability to anticipate the strategic issues of climate change;
2. Commitment to a comprehensive adaptation process;
3. Continuation of the Ministry's contribution to collective mitigation and energy transition efforts;
4. Enhancement of the cooperation process.

2. DEVELOPING KNOWLEDGE AND ANTICIPATION

The knowledge-anticipation function permeates the three other focus areas. Climate research advances daily and is growing considerably, requiring adaption and "transposition" to the specific needs of the armed forces. In order to better anticipate the many implications of climate change for the strategic context and the armed forces' missions and capabilities, enhancement of the ministry's knowledge tools is essential.

2.1 Mapping climate risks

While the armed forces have always taken meteorological and oceanographic factors into account in the conduct of operations, they must now do the same with the climate crisis and its consequences, which vary considerably across regions and countries around the world. Mapping climate risks at the national and regional levels, particularly in zones where the armed forces are present or likely to be, will contribute to this.

2.2 Strengthening monitoring, research and anticipation instruments

Research and monitoring observatories already in place

The geopolitical observatory for climate issues in terms of security and defence ("Defence and Climate Observatory") is the main knowledge & anticipation tool dedicated to climate security within the Ministry for the Armed Forces. Its work is a source of knowledge for all the armed forces and the Ministry's directorates and departments, and is for the most part made accessible to the public in order to contribute to strategic reflection at the national and international levels. The observatory's actions will be long-term and integrate scenario-based exercises.

Other research and monitoring observatories also contribute to the development of knowledge and the ability to anticipate in regions particularly affected by climate change or broader themes such as energy transition and security. Their work will be more widely disseminated and used and efforts will be made to coordinate research work.

Defence & Climate Observatory

Founded in 2016, this observatory is a forward-planning tool designed to provide the Ministry for the Armed Forces with insights into the strategic and geopolitical consequences of climate change, particularly with regard to its impacts on defence institutions and the missions and capabilities of the armed forces. Entrusted to the French Institute for International and Strategic Affairs (IRIS, between 2016-2021) and led by the Directorate General for International Relations and Strategy (DGRIS), it has become a key instrument for ministerial reflection on the topic, as well as for outreach and cooperation with some strategic partners of France, particularly in the Indo-Pacific. The observatory will be renewed for a four-year period in the spring of 2022.

Observatory for energy flows and materials

Run by the DGRIS, this observatory founded in 2019 is coordinated by IRIS, in consortium with Enerdata and Cassini. It aims to improve the knowledge and anticipation capabilities of the Ministry of the Armed Forces on energy developments and their geopolitical and strategic consequences. It contributes to knowledge and thinking on the energy strategies of major powers, energy transition policies and the modes of action of companies in different parts of the world.

Arctic Observatory

Led by the DGRIS, this organisation founded in 2015 is entrusted to the Foundation for Strategic Research (FRS) and is tasked with monitoring major Arctic issues, covering environmental aspects as well as government strategies and those of leading private economic players, military changes, legal matters and technological developments.

The observatory contributes to an "Arctic community" of researchers, institutes and businesses to further reflection on issues in the region. The observatory will be renewed for three years in 2022.

Supporting strategic research

The Ministry will support strategic research on anticipation, adaptation to climate change and the energy transition, particularly through study contracts with research centres, public institutions or by supporting doctoral theses. It will also strengthen its relationships with French social science research centres that are capable of analysing the social, economic, health and political effects of climate change in regions around the world that are of interest to France.

2.3 Collaborating with major scientific research institutes

The Ministry for the Armed Forces signed an agreement with Météo-France when this public establishment was founded in 1993. This agreement covers meteorological support for the armed forces for the conduct of operations and postures related to strategic functions, as well as the training of military meteorologists. In the future, the Ministry will seek to broaden Météo-France's support in terms of climate anticipation adapted to its needs, and in training. It will do likewise with other major scientific partners, including the French space agency CNES, which set up a climate observatory in 2018, the Pierre-Simon Laplace Institute, an international reference in climate science, the Naval Hydrographic and Oceanographic Service (SHOM), the French National Institute for Ocean Science (IFREMER) and the French Geological Survey (BRGM).

Supporting scientific projects of interest to defence

The Ministry for the Armed Forces will continue to support scientific research programmes that help anticipate the consequences of climate change likely to affect its missions.

Kivi Kuaka and MICROPAC scientific programmes

The Ministry for the Armed Forces supports the Kivi Kuaka programme led by the National Museum of Natural History on transpacific migratory bird species that are part of the early warning signs of wave-submersion, tsunamis and possibly tropical storms.

The MICROPAC programme studies the migration of fish species to the cooler waters of the eastern Pacific as a result of ocean warming and acidification. With consequences on the food and economic security of Pacific island countries and the displacement of illegal, unreported and unregulated (IUU) fishing, this effect of climate change is likely to impact the activity of the French Naval Force in the context of its participation in State action at sea.

2.4 Involving all Ministry stakeholders contributing to anticipation

Not only is the origin of crises and conflicts multifaceted, but it is very difficult to isolate climate change from other crisis-causing factors. Nevertheless, the climate factor will become increasingly important in the emergence and intensification of international tensions, as is already the case in the Near and Middle East, South Asia, the Sahelo-Saharan strip and the Arctic.

This major factor of change must be integrated by all directorates and departments contributing to strategic anticipation and analysis, in particular the DGRIS and the network of overseas defence missions it coordinates, as well as by intelligence services and overseas sovereignty and presence forces.

2.5 Initiating comprehensive reflection on operational issues

Reflection has been initiated on the impact of climate change on operations and capacities, including:

- taking climate change into account in the changing international strategic context and in crisis zones where the French armed forces are active or likely to be, as well as the impacts on current and future operations, particularly through scenario-based exercises;

- the consequences of growing demand on the armed forces in terms of cooperation and assisting in the management of crises caused by extreme climate events (humanitarian assistance and disaster relief, and search and rescue operations, both at home and abroad) or epidemic outbreaks, or even pandemics, but also to provide assistance to climate displaced persons;

- the effects of climate change on operational capabilities;

- managing health risks for military personnel generated by the climate crisis, both in training and during operations (very high temperatures, extreme cold, climate hazards, environmental pollution, risks of infection, etc.).

This work will be pursued, developed and will become systematic at every level.

2.6 Improving anticipation of risks for defence infrastructure

The climate crisis is likely to affect defence infrastructure and key dual-use infrastructure on which it depends, and therefore the operational missions it supports. There are multiple risks: rising sea levels; increase in heat waves and droughts; greater fire risks and risks for drinking or industrial water supply; severe floods and landslides; storms and cyclones.

A long-term forward-looking vision of the climate vulnerabilities of military infrastructure, both in France and abroad, is needed to make decisions concerning investments, adaptation or relocation. A framework agreement will be signed with a research centre to analyse the vulnerability of military compounds to climate change, based on the method developed by Defence and Climate Observatory researchers.

Climate change brings greater risks for vegetation, and the first effects have been observed on their health in France. A better understanding of these phenomena is needed to anticipate how forests will evolve in training camps in order to continue to have adequate operational preparedness infrastructure for training, in the medium term. Research will be initiated with this aim.

3. LAUNCHING A COMPREHENSIVE ADAPTATION PROCESS

The adaptation of the armed forces must be guided by knowledge of the effects of climate change and the Ministry's ability to accurately anticipate the many implications it will have for defence. A lot remains to be done in terms of adaptation. It is a huge task, at the centre of this strategy, covering all of the armed forces' missions and capabilities. These future adaptations should be made holistically, in seven key focus areas :

3.1 The need to adapt to changing theatres of operations

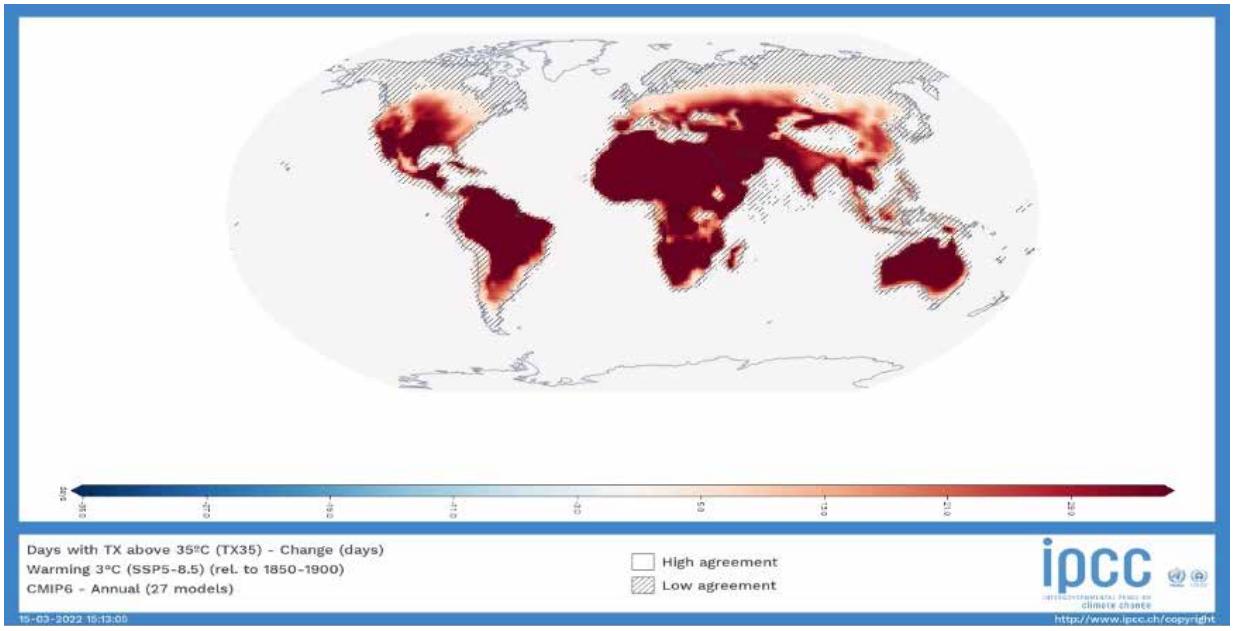
Operational adaptation to extreme cold weather already initiated

The armed forces have already launched an adaptation process, and this is particularly illustrated by the increase in activity, over the past decade, of all three forces in the Arctic region which is now more easily accessible due to the accelerated melting of the ice cover. Three quarters of its volume have been lost in the past forty years and the latest IPCC report projects that the summer ice will disappear at least once by 2050. While economic activities and shipping can be developed as a result of this phenomenon, it also contributes to the development of military activities by countries bordering the Arctic Ocean and those with legitimate interests in the region, like France.

The development of specific expertise in extreme cold weather will continue through military cooperation with most countries bordering the Arctic Ocean, participation in multinational exercises, particularly the Cold Response joint force exercise and the Arctic Challenge air force exercise, or through regular naval presence.

and to be continued for "extreme heat" theatres

New hotbeds of international tension could appear or become more intense due to the consequences of the climate crisis. Access to water, in particular, is a critical factor of crises in many regions, especially in the Near and Middle East, in the Sahel-Saharan strip and in South Asia. Therefore, the possibility of open conflicts intensified by the climate crisis must be considered, along with their implications for France and Europe, which are likely to guide defence policy and the Military Programming Law. On an operational level, response and crisis-management capabilities will need adapting to highly demanding climatic environments where social and economic tensions are exacerbated by climate disruptions.



Days of heat above 35ºC (day/night average) in a world at +3ºC - Source: IPCC

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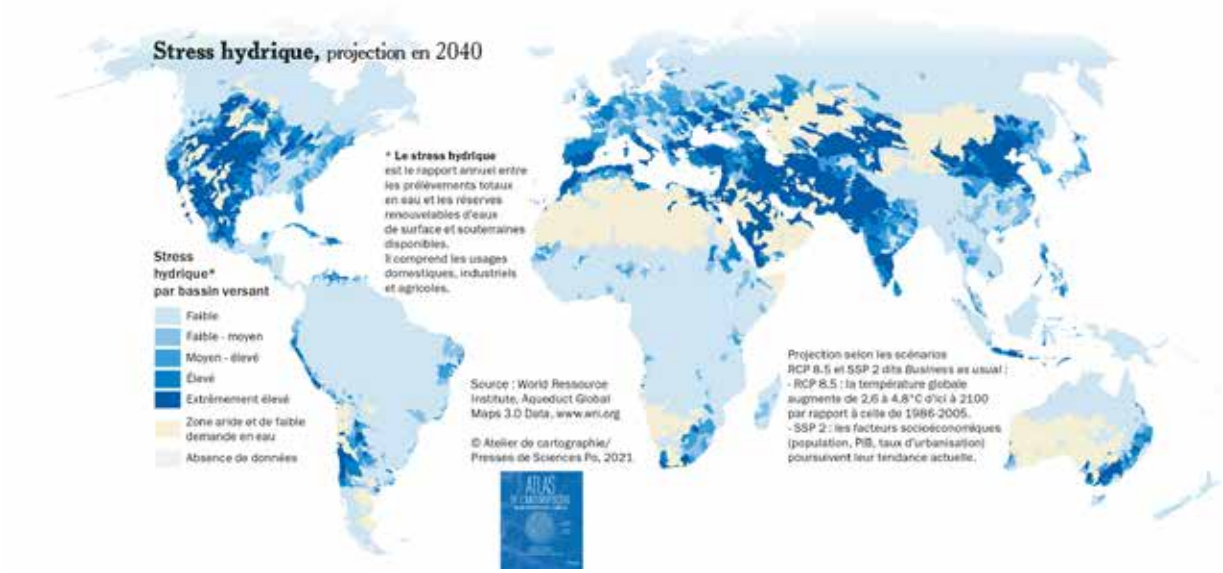

Source : François Gemenne et Aleksandar Rankovic, Atlas de l'anthropocène, Presses de SciencesPo, 2ème édition, 2021

Adapting know-how to extreme environments

Just as the ice melt in the Arctic, which is hence becoming a new hotbed of tension, is prompting armed forces to learn new tactical and operative know-how adapted to extreme cold weather, specific know-how could be acquired and disseminated as a result of the growing number of extremely hot periods in tropical and subtropical countries, particularly in Africa, the Middle East and Asia.

3.2 Integrating climate change into capacity-building process

As climate change makes the environment more hostile, it can affect the performance or service life of weapons systems. For example, increasingly high temperatures in some theatres of operations can cause damage to engines and electronics, affect aircraft load capacities and flight ranges or even create risks for ammunition storage. Ocean warming poses diverse problems, including the question of cooling down machines and systems, while the rising temperatures and salinity of ocean waters modifies submarine acoustics. Soldiers exposed to very harsh environmental conditions must also be protected, and the vehicles, vessels and equipment they use must be adapted accordingly. Some equipment also needs adapting for the deployment of forces in polar regions.

Growing environmental constraints to be considered at a very early stage

The Defence Staff and the French defence procurement agency DGA are building capacities based on foresight of evolving risks and threats, which is decisive for military operations. In this regard, climate risks and their impacts on operational conditions and capability requirements must be identified to guarantee the performance and dependability of equipment whose life cycle from design to decommissioning can exceed fifty years. This approach will be continued and enhanced, in connection with the development of the Ministry's climate security knowledge and anticipation capacities.

Maintaining long-term technological superiority of systems

The technical performances of weapons systems are maintained across their life cycle by constantly integrating feedback from the field – especially from theatres with the most demanding conditions of use – into technical specifications for future equipment. With climate change, it will be necessary to integrate feedback more rapidly and increase the capacity to anticipate in terms of innovation, capabilities and planning.

Innovation in Adaptation: Examples of Projects in the Three Environments

Air: as a temperature rise causes more water evaporation, cloud cover could be more significant and more frequent, with heightened risks of icing at high altitude and ensuing issues for flight safety. Current thermal or pneumatic anti-icing systems cannot be installed on light aircraft (UAVs, light helicopters), which restrict their scope of use. The French Defence Innovation Agency (AID) supports research projects focusing on other innovative technologies that are more cost-effective and capable of being combined to optimise their efficiency.

Land: equipment used in hot areas is under greater strain. Changes are currently being made to system architectures with studies into the replacement of auxiliary power units with Lithium-ion batteries in response to their premature wear-out in a very dusty environment like the Sahel. In parallel, support services are trialling cooling systems in order to regulate the storage temperature and thus limit the ageing of on-board system cells and batteries.

Naval: the problem of micro-organisms accumulating on the surface of boat hulls, which slows down navigation, has been clearly identified for vessels operating in warm waters, and this issue should intensify with the impact of climate change. The technical challenge consists in developing high-performance paints to limit the need for berthing, while preventing impacts on marine ecosystems in accordance with European biocide regulations.

3.3 Adaptation of force employment doctrine, education and training

Integrating climate change into doctrine and planning documents

The directorates and departments responsible for developing concepts, doctrine and experiments will continue to study the consequences of climate change in their field of expertise in order to integrate this new dimension into all relevant operational preparedness documents that serve in planning operations.

Adapting education

The initial and continuing education of soldiers and civil staff employed by the Ministry for the Armed Forces must include actions to raise awareness of climate change and its impacts for defence, as regards both mitigation and climate security. This education should foster the application of energy-saving, environmental protection and water resource management measures, and an understanding of the many strategic, operational, capability and legal issues linked to the climate crisis.

and training

Training for the armed forces must be adapted to the consequences of climate change, which will result in more operations being conducted in regions experiencing very challenging environmental conditions and particularly extreme temperatures liable to affect the activities, stamina and physical and mental health of personnel.

3.4 Adaptation of defence bases and facilities

Guaranteeing infrastructure resilience

Military bases and facilities are essential infrastructure for the conduct of operations as regards logistics support, training or force projection. Their resilience is vital in order to fulfil operational contracts and any compromise of certain capacities could affect essential defence and national security missions. Vulnerability assessments of military compounds carried out by the research institute under a Ministry contract (cf. § 24) will be taken into account in Ministerial real estate and infrastructure policies.

and its adaptation to climate change

Climate change will increase the heat island phenomenon, especially in urban areas. Afforestation operations are already in progress and will be pursued on Ministry for the Armed Forces' real estate.

3.5 The interministerial challenge of humanitarian assistance and disaster relief operations

Both on national territory and internationally, the need for the armed forces to contribute to relief operations after extreme weather hazards or to fighting forest fires (as illustrated by operation Héphaïstos) could indeed increase. Periods of extreme heat should continue to increase, bringing longer and vaster forest fires, as well as more intense rain and wind, and torrential floods. The geographical location of the French overseas territories does not expose them to the same risks, but it is established that the West Indies will be affected by a rise in the number and intensity of hurricanes. Projections are less clear in the Indo-Pacific region concerning tropical storms and cyclones.

The response must be interministerial

In the future, these weather and climate predictions could lead to growing demand for assistance by the armed forces in operations to protect the terrestrial and marine environment and to provide humanitarian relief. This will affect certain operational contracts and therefore require prospective studies. These studies must also be conducted in an interministerial framework, as the Ministry for the Armed Forces will provide capacity support for natural disaster relief operations when the resources of the internal security, civil protection and other Ministries' forces prove to be inexistent, insufficient, unsuitable or unavailable (known in French as the "4 Is" rule). While the government's response is interministerial by nature, the armed forces have unique capabilities, which raises the question of their adequacy to meet the needs of a likely growing number of missions. It should also be noted that military personnel already contribute on a permanent basis to civil protection, in particular the Paris Fire Brigade, the Marseille marine firefighter squadron, and the military civil protection formations (ForMISC).

3.6 Adapting support for the armed forces

The climate crisis can impact the support provided to the armed forces, both in France and abroad. Extreme weather events can disrupt energy supply and transport. Armed forces deployed abroad should not be a burden for the critical resources of the host countries, especially their water resources, as this could alienate local populations by affecting their vital resources. Lastly, the logistics support provided to forces deployed overseas, particularly water and energy, can be a significant burden and also expose logistics flows to hostile forces.

Reinforcing the water and energy self-sufficiency of projected camps

Therefore, efforts will be made to reinforce the energy and water self-sufficiency of projected bases that are highly dependent on vulnerable logistics flows. More broadly, studies will continue on how climate upheavals impact support and logistics for the armed forces, as part of an approach to anticipate and adapt.

Eco-Camp Project

The Eco-Camp project is managed jointly by the Defence Staff and the Defence Infrastructure department (SID) with three focus areas: reducing water and energy consumption, implementing systems for self-producing renewable energy and reusing water resources, and smart and optimised management of energy and water flows. The principle is based, on the one hand, on research and development of innovative technological solutions and, on the other, on dual technical and operational experimentation. This concept will eventually allow the projection of more cost-effective and sustainable camps.

3.7 Guaranteeing the armed forces' operational capacity in accordance with regulatory requirements

Climate and environmental issues are at the centre of an international and European movement whose objectives are then transposed into domestic legislation. Integration of environmental issues and the development of European regulations are gaining speed to achieve the goals of the European Green Deal. The ability to guarantee continuity of military activities in a strict regulatory context requires knowledge and anticipation of the many legal requirements and obligations and the possibility of defending specific defence needs in European and international fora.

In preparation, this means promoting defence interests at interministerial level, while maintaining efficient coordination between the Ministry for the Armed Forces, the Defence Industrial and Technological Base (DITB) and European defence ministries. Defence interests will then be promoted to other Ministries responsible for national legislation, whether or not it transposes European provisions.

4. PURSUING MITIGATION AND ENERGY TRANSITION EFFORTS

For almost two decades, the Ministry for the Armed Forces has been pursuing a sustainability policy that has led to strong measures to protect the environment. With the first Ministerial energy efficiency strategy in 2012, it also began managing its consumption. In 2020, the Ministry defined a defence energy strategy which now applies to all the armed forces, directorates and departments. These strategies not only meet environmental standards, they also contribute to public sustainable development and energy transition policies, and to the government's mitigation goals. Further efforts must be made while guaranteeing the response capabilities of the armed forces anytime, any place and under any circumstances.

4.1 A Ministry already highly committed to fighting climate change through environmental protection

Contributing to the national low-carbon strategy through military land

As the largest occupant of public real estate, the Ministry for the Armed Forces manages approximately 275,000 hectares, 70% of which are used for training purposes. They feature particularly rich biodiversity covered by several different statuses (Natura 2000, regional nature parks, national nature reserves, etc.). By preserving ecosystems on its land, especially those with high potential for carbon sequestration (forests, meadows, moors, peat bogs and wetlands), the Ministry contributes directly to the goals of the national low-carbon strategy.

Increasing carbon sequestration on military land

In partnership with the French federation of natural area protection boards, the Ministry for the Armed Forces carries out research to assess the carbon stock at military sites and optimise management of natural areas to increase storage capacities. This action makes a direct contribution to the national low-carbon strategy.

Treating pollution to contribute to environment rehabilitation

The Ministry is involved in treating pollution in different environments (soil, water) and this rehabilitation contributes to fighting climate change. Industrial soil decontamination operations primarily target pollution caused by hydrocarbons, polychlorinated biphenyl or heavy metals as a result of maintenance activities or exercises, in order to restore the environment's ability to withstand the impacts of climate change. The Ministry will continue its actions in this area by improving knowledge of polluted sites and soils and financing decontamination operations.

4.2 An eco-design approach to be continued

In the early 2000s, the DGA introduced a policy to manage environmental risks liable to affect the performance of weapons systems. This eco-design approach, based on anticipating regulatory developments and rapidly transposing them in the specifications of weapons systems, has supported the development of environmental regulations and, when necessary, has limited impacts on the operational performances of equipment. This approach has been stepped up for major armament operations by deploying design strategies with a lower environmental footprint (Eco-Design Grid - GRECO), including environmental impact analyses over the life cycle of systems, for the most recent projects. The aim is also to maintain or strengthen the operational advantage, particularly in terms of range, stealth, reduced dependence on certain non-renewable materials and protecting user health.

4.3 A defence energy strategy BASED ON adaptation and mitigation

Preparing for the post-oil era

The armed forces carefully monitor the question of the availability and accessibility of oil resources worldwide. Global conventional oil production reached its peak in 2008 and today's production cannot be maintained at this level beyond the current decade. A decline in global oil production by 2030-2040 is therefore inevitable. In addition to this drop in supply, fossil fuels must be used less in order to reduce GHG emissions and combat global warming. Furthermore, the Russian invasion of Ukraine and its consequences on oil and gas supplies in Europe are raising awareness of the continent's energy vulnerability, and the need for diversification of sources and a change to the energy mix.

An energy strategy contributing to both mitigation and adaptation

The defence energy strategy adopted in 2020 aims to control fossil fuel consumption and increase energy efficiency, thereby contributing to the mitigation effort, while also stressing the need to secure supplies for the Ministry for the Armed Forces and make the energy transition an operational asset. Its implementation therefore contributes to both mitigation and adaptation objectives.

A significant decrease in the energy consumption of infrastructure

By controlling and optimising its consumption, the Ministry intends to reduce its energy, logistics and environmental footprint. Excluding operational energy, in 2012, the Ministry introduced an energy efficiency strategy based on 18 actions to improve the energy performance of infrastructure and develop renewable energies.

The Ministerial Energy Efficiency Strategy

The key actions of this strategy include the development of energy efficiency contracts which should allow the Ministry to reduce its CO2 emissions by approximately 37,000 tonnes by 2030, replace all of the most polluting boilers, and develop energy management systems for the most energy-intensive sites. There are also plans to support clean mobility by installing charging stations in support of the clean mobility deployment plan. Regarding renewable energy, the Ministry is particularly connecting sites to urban heating networks and takes part in innovative projects such as hybrid power plants.

which will reduce greenhouse gas emissions

Through all these actions, the Ministry has therefore reduced its consumption of fossil fuels by 22% compared to 2010, excluding operational energy. It will pursue these efforts in line with European and national objectives to lower greenhouse gas emissions. Therefore, based on current measures, a 30% reduction in final energy consumption and a more than 50% decrease in GHG emissions from property occupied by the Ministry can be expected by 2030, again compared to 2010 levels.

Energy conservation and energy transition to improve efficiency and self-sufficiency

Three quarters of the Ministry's energy consumption, including operations, concern mobility, with infrastructure accounting for the remaining quarter. On an operational level, through upstream education and training and wider application of uses and organisations aiming to save energy, the Ministry intends to improve its energy self-sufficiency in operations and its efficiency, thereby generating an indirect reduction in its environmental impact.

Regarding weapons systems, the defence energy strategy sets out the priority actions. They must allow a gradual transition to a sovereign and lower-carbon energy mix to contribute to the GHG emission reduction goals defined by the national low-carbon strategy, while guaranteeing the military performances expected in operations and autonomy for the forces.

Developing innovation in energy

In conjunction with DITB companies, the DGA and the AID support innovation in the field of energy by taking advantage of civil innovations and adapting them to the military specificities of each environment. While innovation aims to maintain the operational advantage, it should also contribute to reducing the energy and environmental footprint of future weapons systems. Energy transition technologies allow new functions to be envisioned (increased power, stealth and discreet approach, etc.) while simplifying the use of systems (reduced logistics requirements, greater range and endurance, resilience). This action will be pursued, in compliance with the guidelines of the defence energy strategy.

Innovation in Operational Energy

Innovation actions spearheaded by the defence energy strategy are in progress at the DGA and the AID to support new architectures and technology building blocks in the three environments:

- Land: hybrid armoured vehicles are being trialled with the production of a Griffon-based demonstrator by 2025, in order to consider scaling up for next-generation or standard armoured vehicles. For the energy supply of ground troops, use of hydrogen has been studied to improve the energy/mass ratio.
- Naval: the POSEIDON study (French-Italian cooperation) focuses on introducing fuel cells into surface vessels.
- Air: the RAPID HYDRONE project has paved the way to using hydrogen fuel cells for small UAVs, allowing a significant increase in endurance compared to battery-powered drones.
- All three environments: the research study GENOPTAIRE aims to diagnose consumption based on different use scenarios in order to guide architectures, particularly in propulsion, with a view to reducing fossil-fuel dependency and increasing the range. The integration of alternative sources with a lower carbon footprint is particularly being studied.

5. SPEARHEADING INTERMINISTERIAL, INTERALLIED AND INTERNATIONAL COOPERATION MOMENTUM

The response to the global challenge that climate change represents must be collective. International cooperation is therefore a priority and to be effective, it is vital to develop a holistic approach within the Ministry of the Armed Forces and to strengthen interministerial coordination.

5.1 New ministerial governance

To reinforce the Ministry's action in all areas related to climate change and implement a comprehensive strategy, the Ministry will introduce ad hoc governance. Implementation of the Climate & Defence strategy will be led by a permanent secretariat, working with the Ministry's Climate & Defence Coordinator, in conjunction with the "climate correspondents" appointed in the armed forces, directorates and departments. This organisation will report regularly to the Ministry for the Armed Forces on the progress of major projects. It will also define guidelines and make the necessary decisions.

The Ministry's Climate & Defence Coordinator will have a complete view of the climate security challenges and actions undertaken, as well as the energy and sustainability strategies implemented in connection with climate change. This organisation will facilitate information and knowledge sharing within the Ministry, monitor measures taken by the armed forces, directorates and departments, foster cooperation between departments and the dissemination of good practices, ensure overall coordination, in accordance with each entity's sphere of competence, and prepare the necessary decisions to be made.

Representing the Ministry at interministerial level and internationally

This governance will facilitate the consolidation of ministerial positions and communication about the strategy to other ministerial and international stakeholders, thereby allowing the views of the Ministry for the Armed Forces on climate and defence to be voiced in high-level national and international talks, notably at EU and NATO level. It will enable the different Ministry stakeholders to dialogue with their ministerial or international partners in their field of action and authority. The Ministry will also develop communication on the Climate & Defence strategy and its implementation, covering every dimension and targeting the general public and civil society stakeholders.

Monitoring action plan implementation

By the end of 2022, in conjunction with all the Ministry stakeholders, the permanent secretariat will propose a policy and action plan to be conducted through to 2030. It will then monitor the implementation of this plan.

5.2 Broadening and strengthening interministerial interaction

Several ministerial departments are likely to contribute to implementing the Climate & Defence strategy of the Ministry for the Armed Forces, by providing scientific and technical knowledge and expertise (particularly the Ministry of Ecological Transition and the Ministry of Higher Education, Research and Innovation), by shedding light on international issues and international cooperation (Ministry for Europe and Foreign Affairs, Ministry of the Sea) or by responding to crises (Ministry of the Interior, Ministry of Overseas France).

The Ministry will build regular dialogue with its ministerial partners in the four focus areas of the Climate & Defence Strategy to identify potential synergies, while asserting the specificities of the armed forces' missions and routine and operational activities which need to be taken into account in the context of setting standards.

5.3 Developing international cooperation at every level

Beyond the need for international defence institutions to be aware of the defence and security challenges of climate change, it is also necessary to encourage joint action, particularly in terms of protecting the land and marine environment and responding to natural disasters. Climate security initiatives sometimes take place in the context of power competition, which requires appropriate influential responses from the Ministry.

At regional level

The Ministry for the Armed Forces has taken part in the Pacific Environmental Security Forum since 2019 and has already lodged climate security questions in several international fora for discussion and cooperation of which France is a part, particularly the 5+5 Defence initiative for the Western Mediterranean, the South Pacific Defence Ministers' Meeting (SPDMM), the Indian Ocean Commission and the Indian Ocean Naval Symposium. This approach should be continued and extended to other regional fora in order to raise our partners' awareness, build a common vision of the issues at stake, share best practices, and even establish action plans, as was the case in the South Pacific and today within the framework of the French presidency of the Indian Ocean Commission.

Depending on the case, this international cooperation may include joint studies on anticipating climate risks and their impact on defence and security, sharing good practices on adaptation and mitigation, or joint responses to natural disasters and environmental protection challenges, in particular in the maritime domain.

In the context of NATO and the European Union

As part of its quest to improve knowledge of GHG emissions, France will actively participate in NATO's work to develop a methodology for evaluating GHG emissions adapted to the armed forces, both to benefit from the good practices of our allies and to standardise approaches to measuring the armed forces' footprint. This work will contribute to a better understanding of the ministry's GHG emissions, thereby allowing it to determine possible action levers for each type of emission.

The Ministry for the Armed Forces has made the energy-environment theme a focus of cooperation between the EU and NATO, in particular through a project relating to interoperability in the field of camp energy and pooling purchases for the development of a European biofuel sector.

Since 2014, the Ministry has taken part in the Consultation Forum for Sustainable Energy in the Defence and Security Sector (CF-SEDSS), an initiative funded by the European Commission and managed by the European Defence Agency (EDA). This forum aims to create a defence energy community to share information, know-how and best practices in order to improve energy management, increase energy efficiency and building performance, use renewable energy sources and enhance the resilience of defence-related energy infrastructure. In this context, the EDA has approved a Ministry project for an energy self-sufficient and resilient military base (ENSSURE project), based on building performance, renewable energy generation and storage, and optimised energy flows (smart grid).

European Energy and Environmental Cooperation

The Ministry of the Armed Forces is involved in developing multidisciplinary or capacity-building projects concerning energy and the environment within the European Union through:

- the European Defence Fund (EDF), which includes an energy and environment focus area. In 2021, France supported three EDF projects: on energy self-sufficiency of camps in operation, electric power storage in camps and the energy efficiency of next-generation aircraft engine propulsion.
- CAPTECH (capability technology) Energy and Environment, managed by the EDA;
- The permanent cooperation project (PESCO) on the Operational function of energy.

On a legal level

The Ministry for the Armed Forces will continue to influence the European standard-setting process in order to preserve the operational capabilities of the armed forces, in an international context marked by a broader field of competition in which certain States are not subject to demanding environmental standards. To this end, its participation in European networks has been reinforced:

- It plays an active role in DEFNET, a network of legal and engineering experts from the European defence ministries, of which it is Vice-President;
- It contributes to studies carried out by the EDA on revising climate and energy regulations, within the framework of the European Green Deal;
- The legal directorate is managing the organisation of a conference in June 2022 in the context of the French Presidency of the Council of the European Union, which addresses wide-ranging technical and political topics and is the major biennial meeting for the defence community in Europe on environmental matters.

5.4 Maintaining the momentum of the global initiative launched at the Paris peace forum

In November 2021, at the Paris Peace Forum, the Minister for the Armed Forces Florence Parly, launched the "climate change and armed forces" initiative. The joint ministerial declaration and the accompanying roadmap are currently supported by 26 States from around the world. Efforts will be pursued to expand international participation in this unique initiative as much as possible.

The roadmap is based on four focus areas: anticipating risks, adapting the armed forces, reducing the environmental footprint of defence institutions, and international cooperation. The Climate & Defence strategy contributes to implementing this multilateral commitment.

GLOSSARY

Adaptation : the process whereby environmental, social and economic systems adjust to an established or anticipated climate stimulus, and its effects and impacts. It refers to a change in procedures, practices and structures to restrict or reverse potential damage or to leverage opportunities created by climate change.

Biodiversity : biodiversity is the biological variability of living organisms of all origins including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part.

Climate : climate means the average weather conditions in a region over a long period.

Climate change : a change in the state of the climate, which can be detected by differences in the mean and/or variability of its properties and which persists over a long period, usually several decades or more. Climate changes may be due to natural internal processes or external forcing, especially modulations of solar cycles, volcanic eruptions or persistent anthropogenic changes in atmospheric composition or land use. Climate changes attributed directly or indirectly to human activity alter the composition of the earth's atmosphere and add further to the natural vulnerability of the climate.

Eco-design : eco-design is the process of integrating environmental protection into the design of goods or services. The aim is to reduce the environmental impact of products across their life cycle, from the extraction of raw materials to production, distribution and use, through to their decommissioning.

Energy transition : the energy transition aims to prepare for the post-fossil fuel era and to develop a robust and sustainable energy model in response to energy supply issues, price trends, resource depletion and environmental protection requirements.

Greenhouse gas : natural and anthropogenic gaseous constituents of the atmosphere, which absorb and emit radiation at given wavelengths in the spectrum of terrestrial radiation emitted by the Earth's surface, atmosphere and clouds.

IPCC : the Intergovernmental Panel on Climate Change, established in 1988 by the World Meteorological Organisation (WMO) and the United Nations Environment Programme (UNEP) to report on the state of scientific knowledge on global climate change, its impacts and ways to mitigate it.

Mitigation : human action to reduce greenhouse gas sources or enhance GHG sinks.

Ocean acidification : reduction in ocean pH over a long period, usually several decades or more, caused mainly by the sequestration of carbon dioxide present in the atmosphere.

Standards : a set of rules or codes stipulating or defining the performance of products (classification, characteristics, test methods, rules of use, etc.). Product and technology or performance standards define the minimum requirements for the products or technologies concerned.

Sustainable development : development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

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À HAUTEUR D'HOMME

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271 000 hommes et femmes, dont 22 % de femmes.
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7 milliards d'euros de Recherche & Développement pour 2022, dont 1 milliard consacré à l'innovation.

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