

Note

HUMANITARIAN ASSISTANCE AND DISASTER RELIEF OPERATIONS IN RESPONSE TO CLIMATE-RELATED DISASTERS : WHAT ROLE AND CHALLENGES FOR THE FRENCH ARMED FORCES ?

May 2024





The Defence and Climate Observatory, launched in December 2016, aims to study climate-related security and defence issues.

It is coordinated by IRIS as part of the contract carried out on behalf of the French Ministry of Defence's Directorate General for International Relations and Strategy (DGRIS). The Observatory's multi-disciplinary team includes researchers specializing in international relations, security, defence, migration, energy, economics, climatology and health. It is directed by Julia Tasse and François Gemenne.

The Observatory has initiated numerous collaborations with European partners (Netherlands, Luxembourg) and international partners (Australia, United States, India), international NGOs and national and international public bodies. These initiatives have strengthened cooperation on climate issues and their security implications.

The Climate and Defence Observatory produces reports and notes, organises restricted seminars and conferences open to the public, and hosts the podcast "On the climate front".

www.defenseclimat.fr/en

The Ministry of Defence regularly calls upon private research institutes for outsourced studies, using a geographical or sectoral approach to complement its external expertise. These contractual relationships are part of the development of the defence foresight approach, which, as emphasised in the latest White Paper on Defence and National Security, *"must be able to draw on independent, multidisciplinary and original strategic thinking, integrating university research as well as specialised institutes"*.

Many of these studies are made public and available on the Ministry of Defence website. In the case of a study published in part, the Directorate General for International Relations and Strategy may be contacted for further information.

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The French armed forces regularly carry out **emergency relief operations** in support of civil protection forces. These operations, also referred to as *Humanitarian Aid and Disaster Relief* (HADR), involve **providing humanitarian aid and relief in the event of disasters or emergencies**. When they are carried out on national territory, armed forces implement them on request, in addition to civil protection forces according to the French "4i" rule¹: the resources of these forces must be judged to be non-existent, unsuitable, insufficient or unavailable. These interventions can also be carried out externally at the request of a State in difficulty, and can take the form of bilateral aid, or be part of multilateral aid processes, notably through the European Civil Protection Mechanism (ECPM) or the United Nations Office for the Coordination of Humanitarian Affairs (OCHA).

Climate change induces a general increase in intensity and frequency of natural disasters. In this context, many researchers and defence actors point out that armed forces interventions are more frequent, or should be in the near future, to respond to these disasters (Lobry, 2017; Palle & Jolly, 2020; Defence and Climate Observatory, 2021). This concern is expressed in the French Ministry of Defence's Climate and Defence Strategy, which mentions civil security support missions that are "likely to increase in number" (Ministry of Defence, 2022). It has also led to two dedicated publications: a report by the Future Conflicts Observatory (FRS/IFRI, 2021) and an article by the Institute for Advanced Studies in National Defence (IHEDN) auditors (2021)². However, to date, no work to date appears to have documented the past HADR military operations, and **the absence of scientific evidence in this area weakens strategic thinking and projections on the future development of the role of the armed forces** (Labbe, 2023). In this report, the Defence and Climate Observatory aims to examine the evolution in frequency and intensity of climate-related natural disasters³ and lays the first⁴ graph of the evolution of the climate-related natural disaster⁵ **over the last ten years (I)**. Secondly, the link between climate change and HADR operations is examined from an international perspective, with these operations being analysed as a potential factor of influence or power **(II)**. Based on these analyses, the third part of the report proposes prospective scenarios and recommendations for the Ministry of Armed Forces **(III)**.

¹ The French "4i" rule states that French military forces can be deployed if civil protection resources are non-existent, insufficient, unsuitable or unavailable, in French: "inexistants, insuffisants, inadaptés, indisponibles".

² The first focuses on the legal frameworks and capability issues involved in the proliferation of HADR operations for the French armed forces. The second, which is shorter, mainly develops a comparative approach to the practices of countries in the transatlantic zone (United States, Germany, Spain) to consider the adaptation or improvement of the French model and focuses on capability and cooperation dynamics. A summary of each of these publications is appended to this report.

³ By "climate-related natural disasters", we mean any disaster that may be caused by climate change, or whose intensity and/or frequency may be exacerbated by climate change. See definition in the glossary.

⁴ See definition in the glossary.

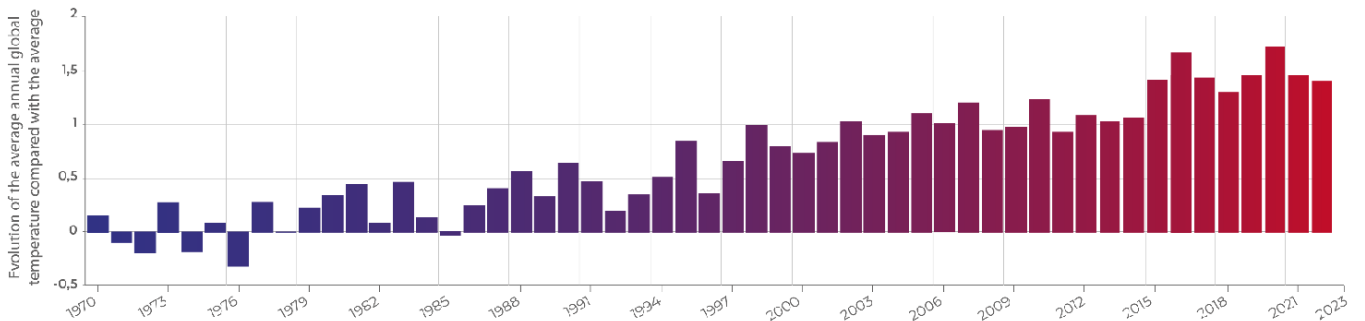
⁵ See definition in the glossary.

I – CLIMATE CHANGE, NATURAL DISASTERS AND HADR OPERATIONS

1. Climate change and natural disasters

According to recent scientific literature, and in particular the reports of the Intergovernmental Panel on Climate Change (IPCC), climate change is inducing several extreme phenomena, the frequency and intensity of which are increasing beyond the natural variability of the climate. Climate change is likely to trigger disasters such as floods, storms, forest fires and droughts (IPCC, 2022, p. 1226). These events can result in major human and economic losses and damage to infrastructure, particularly in highly urbanised areas that are subject to strong demographic pressures and have not benefited from sufficient adaptation efforts. Existing vulnerabilities play a major role in the extent of damages caused by these climatic events. Such damages are sometimes irreversible, when natural and human systems are pushed beyond their capacity to adapt. As the global average temperature rises, changes in the extremes continue to increase. Every 0.5°C increase, for example, leads to an increase in the intensity and frequency of heat waves and heavy precipitation, as well as droughts. An increase in global temperature of less than 2°C could increase the global population's exposure to forest fires by around 30% (Lange et al., 2020).

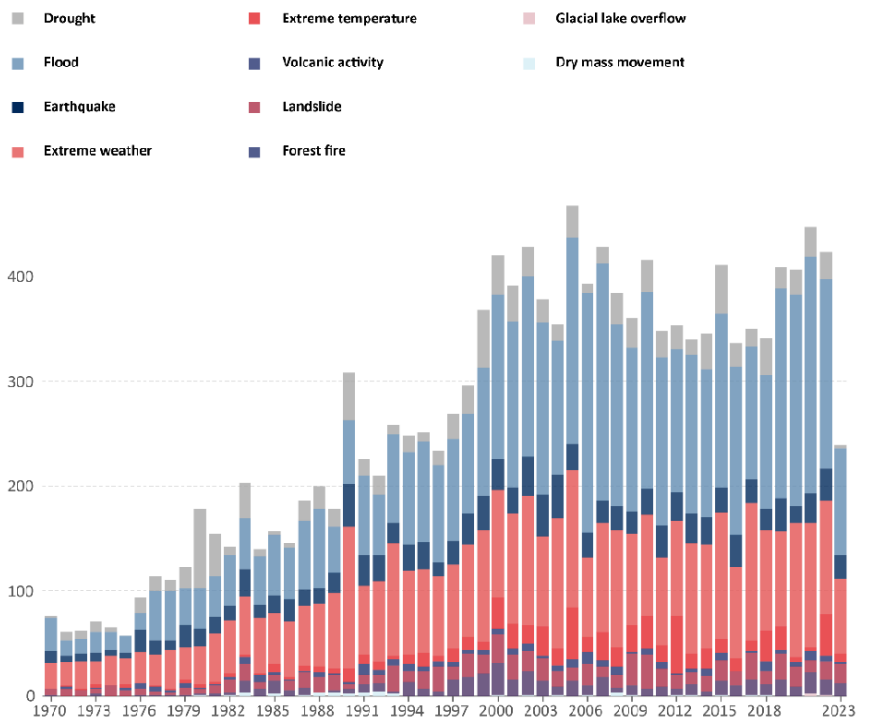
Figure 1 – Increase in annual global average temperature from 1970 to 2023 in comparison to the average from 1951 to 1980



Source: FAO Temperature Change.

Figure 2 - Evolution of the number of natural disasters worldwide by type

Climate change is therefore leading to an increase in the frequency and often intensity of extreme events such as land and sea heat waves, heavy precipitation, drought, tropical cyclones, forest fires and coastal flooding. While the increase in the frequency of these phenomena reported in Figure 2 can also be explained by an improvement in the capacity to collect data on natural disasters, the contrast between natural disasters of climatic origin, where the increase in frequency is very marked, and natural disasters of non-climatic origin, such as earthquakes or volcanic eruptions, where the increase is more modest, is striking.



Source: EM-DAT, CRED / UCLouvain (2023)

Note: these figures include disasters recorded up to September 2023.

OurWorldInData.org/natural-disasters | CC BY

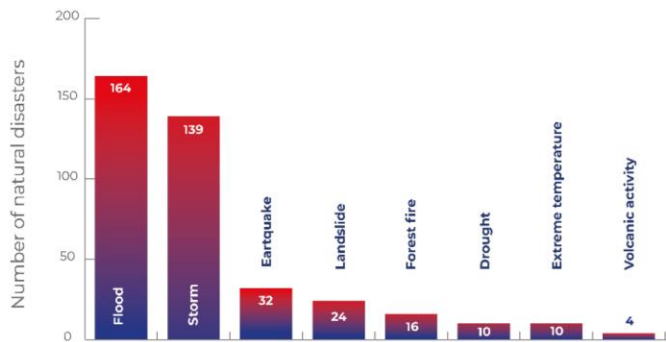
In 2023, floods accounted for 41% of the 399 natural disasters recorded worldwide, making them the most common natural disasters (Figure 3). Storms (including cyclones, typhoons and hurricanes, depending on their intensity and location) accounted for 34% of the total. They are the second most frequent type of natural disaster, ahead of earthquakes, which are not linked to climate change, and landslides, which were the third most frequent type of climate-related disaster in 2023.

According to the INFORM Risk Index, which assesses people's exposure to climate-related disasters (Figure 4), in 2023 the Asian continent was the most exposed to flooding, with eleven of the fifteen countries most affected (Bangladesh, Vietnam, Myanmar, Cambodia, Laos, Pakistan, Thailand, China, India, Iraq and Russia). East Asia is also home to the countries most exposed to tropical cyclones (Japan, Philippines, South Korea, Vietnam, China, India), along with the Caribbean islands (Antigua and Barbuda, Bahamas, Cuba, Dominican Republic, Haiti, Jamaica) (Figure 5).

The four countries most at risk of drought in 2023 are in Africa: Somalia, Namibia, Zimbabwe and South Africa. Four other African countries are also among the fifteen most at risk: Djibouti, Mauritania, Kenya and Mali (Figure 6). The countries of Western Asia (Iraq, Jordan, Syria) and Central Asia (Afghanistan, Tajikistan, Mongolia) are once again very well represented.

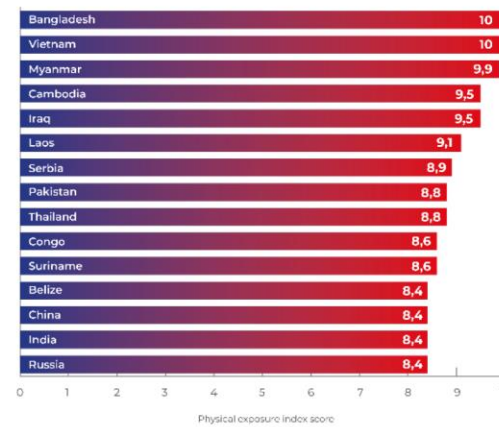
Continental and insular Asia, Africa and the insular Caribbean are the areas most affected by the world's most frequent climate-related natural disasters: floods, cyclones and droughts. On the international stage, this exposure induces geostrategic risks for affected countries, risks that are more or less heightened depending on their financial capacity and vulnerability. In particular, they may develop a dependence on states that are in a position to provide assistance on their territory. However, the exposure of states to such disasters can also be an opportunity: the chance to develop disasters' expertise, and to develop relief skills on their territory that can subsequently be put to good use on the international stage (see part II).

Figure 3 – Number of natural disasters worldwide in 2023, by type



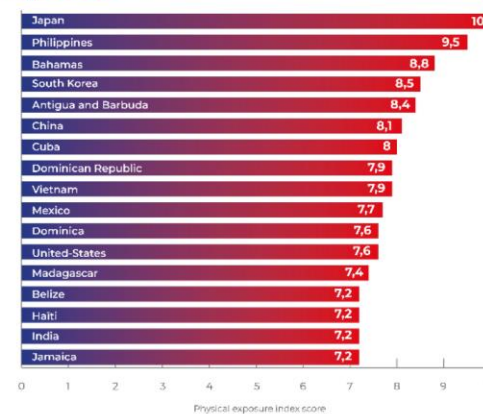
Source: Centre for Research on the Epidemiology of Disasters (CREDE). (March 20, 2024). Number of natural disasters worldwide in 2023, by type [Graph]. In Statista.

Figure 4 - The 15 countries most exposed to flood risk in 2023



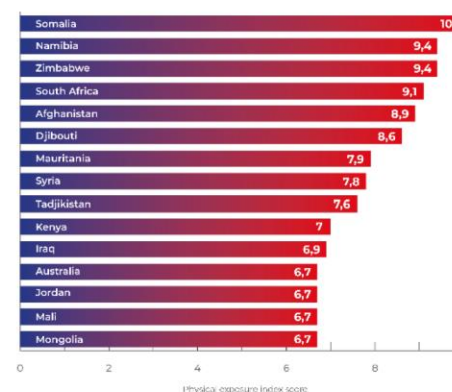
Source: European Commission. (March 31, 2023). Countries most exposed to floods worldwide in 2023, by risk index score [Graph]. Statista.

Figure 5 - The 15 countries most exposed to cyclone risk in 2023



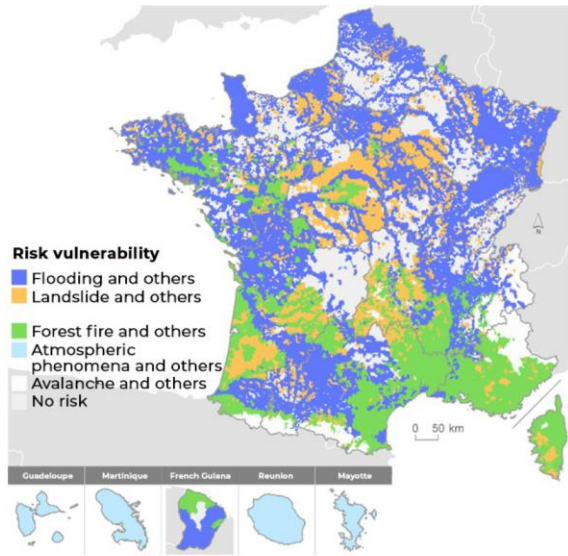
Source: European Commission. (March 31, 2023). Countries most exposed to tropical cyclones worldwide in 2023, by risk index score [Graph]. Statista.

Figure 6 - The 15 countries most exposed to drought risk in 2023



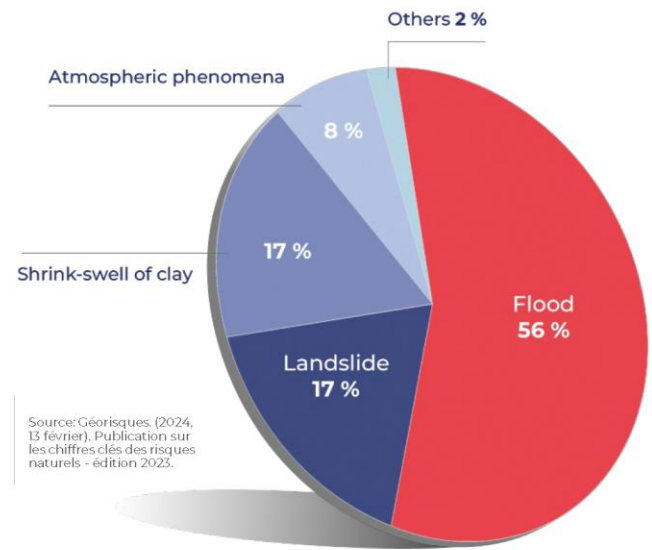
Source: European Commission. (March 31, 2023). Countries most exposed to droughts worldwide in 2023, by risk index score [Graph].

Figure 7 – Map of the vulnerability of French regions to climate risks



Source: MTES, Gaspar, 2017 - © IGN, BD Cartho, 2016 - © Traitements : SDES, 2019

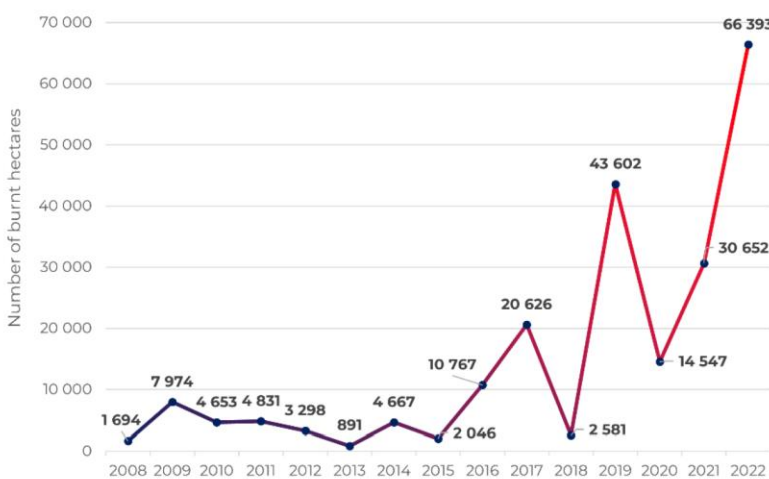
Figure 8 – Distribution of risks in France in 2023 by type



Source: Géorisques, (2024, 13 février). Publication sur les chiffres clés des risques naturels - édition 2023.

Flooding, which is greatly exacerbated by climate change, accounts for 56% of natural hazards in France. It is the natural hazard to which most of mainland France is most vulnerable, particularly along the French coastline from Calais to La Rochelle, and in the catchment areas of France's major rivers: the Rhine, the Rhône, the Loire, the Seine, the Garonne and the Adour. In France, **18.5 million people live in flood-prone areas, primarily due to river overflow** but also, to a lesser extent, due to marine submersion. The second and third greatest natural risks in France are landslides (landslides, mudslides, etc.) and the shrinking and swelling of clays, risks that have also been amplified by climate change. They mainly affect the Centre-Val de Loire, Landes, Dordogne, Cantal, Puy-de-Dôme and the west of the Grand-Est region. Finally, atmospheric phenomena are identified in Figure 8 as the fourth major natural risk. This includes forest fires, which are favoured by hot weather and drought, and storms. Forest fires mainly affect southern regions, Corsica, Morbihan and Sarthe. Storms, meanwhile, mainly affect overseas territories - Guadeloupe, Martinique, Réunion and Mayotte - except for French Guiana, which is mainly exposed to risks of flooding and forest fires.

Figure 9 – Number of hectares of forest burnt in mainland France between 2008 and 2022



Source: European Forest Fire Information System. (1^{er} avril, 2023).
Nombre d'hectares de forêts brûlées en France entre 2008 et 2022 [Graphique]. Statista.

Figure 9 illustrates the **drastic increase in the number of hectares of forest burnt between 2008 and 2022.** The year 2022 broke the record of 2019, with more than 60,000 burnt hectares, not only in the south-east of France, but also in Gironde, Brittany, the Jura and the Vosges. Forest fires are becoming increasingly intense and fast-moving, prompting some actors to speak of "megafires". Over the same period, and sometimes for a smaller number of forest fires, **burnt areas are greater than in the past.** As a result, burnt areas in 2022 are more than 40% greater than in 2019, even though there were fewer forest fires. In all, more than 219,000 hectares of forest burnt in France between 2008 and 2023, is almost 2,200km².

2. Evolution of the frequency of HADR operations carried out by the ForMiSC (civil protection military units) and French armed forces

The idea that HADR operations conducted by the French armed forces is increasing in response to extreme climate events seems to be more of an impression than a scientific fact (Labbe, 2023). The increase in frequency and often in intensity of climate-related disasters cannot in fact be sufficient to project a parallel increase in the commitment of armed forces, since other factors come into play, including, particularly, the strengthening of civil protection means, which could make it possible to absorb growing climatic pressures. To the best of our knowledge, **no data has been collected on the frequency of these interventions as a result of climate change**. In addition, no commitment of this kind has been requested or coordinated by the Interministerial crisis management centre (COGIC), which has so far only requested the exceptional reinforcement of military means for the transport of civil protection forces (aircrafts in particular). This means that **no crisis management process at a national level in response to a climate-related disaster has involved the deployment of additional military means**, in addition to permanent civil protection personnel: the Civil Protection Military Units (ForMiSC), made up of three Civil Protection training and intervention units (UIISC), and the Paris Firefighters Brigade (BSPP). This raises the question of climate-related disasters that have led to the deployment of military resources at local, departmental or zonal level. To answer this question, **the Defence and Climate Observatory has carried out an open-source survey of the engagement of French armed forces between 2007 and 2023 in climate-related disasters**, in support of military civil protection forces (figure 12). To support these reflections, data concerning the commitment of ForMiSC units were also collected (figures 10 and 11).

Figure 10 - Evolution of the number of HADR operations of ForMiSC units on the national territory in response to climate-related disasters (2014 - 2023)

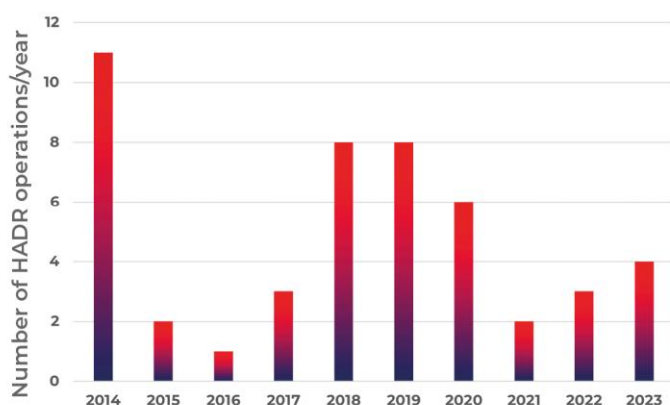
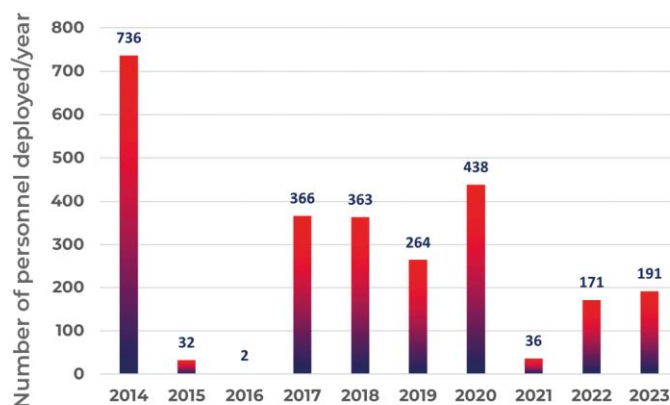


Figure 11 - Evolution of the number of ForMiSC personnel deployed on the national territory responding to climate-related disasters (2014 - 2023)

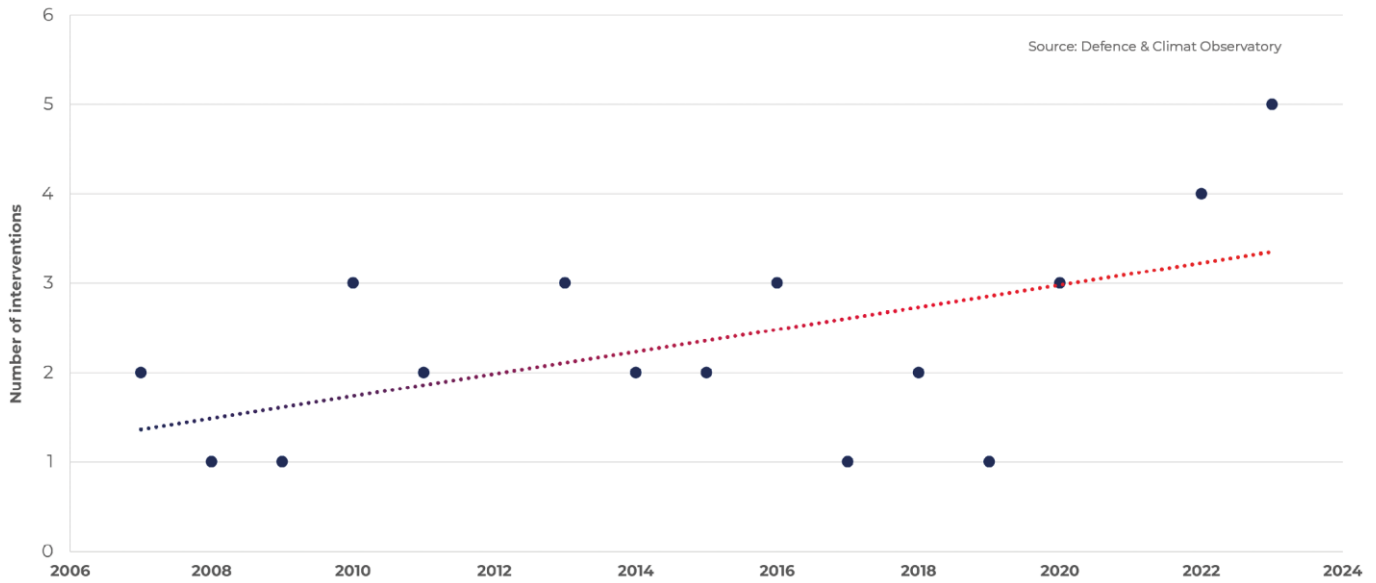


Source: COGIC

Source: COGIC

At the request of the Defence and Climate Observatory, the COGIC realised a survey of operations carried out by the Civil Protection Military Units (ForMiSC) between 2014 and 2023 in France. According to this data, **48 ForMiSC deployments took place between 2014 and 2023, for a total of 2,599 ForMiSC personnel deployed in response to climate-related disasters**. 38% of the disasters that led to their deployment were forest fires, 33% were floods and 29% were storms or cyclones. 2014 was the year in which the most HADR operations were conducted, and the most personnel deployed, in particular due to violent flooding in the south of France in the autumn (186 ForMiSC personnel were requisitioned in November in the south-east). Out of only three HADR operations carried out in 2017, more than 75% of the personnel involved (280) were mobilised in the Antilles, following hurricanes Irma and Maria. In 2020, HADR operations were less frequent than in the previous two years, but a higher number of personnel were mobilised, due to the scale of storm Alex (210 military personnel). Over the period studied, which remains limited, human resources of the civil protection units proved to be sufficient (no reinforcements were requested from the Ministry of the Armed Forces) and the engagement of ForMiSC did not increase over time. Rather, they take the form of peaks of activity in particularly affected years (2014, 2018, 2020), which are accompanied by a **commitment of additional technical military means**: in 2014, 58 land carriers, or again in 2018, 28 land carriers, and in 2020, one aircraft. These figures suggest that, overall, the civil protection workforce could be sufficient to respond to major climate-related disasters on French territory, but that there may be a shortage of resources for transporting personnel and equipment (Nisslé, 2024).

Figure 12 - Evolution of the number of HADR operations by armed forces in response to climatic disasters (2007 - 2023), off ForMiSC*



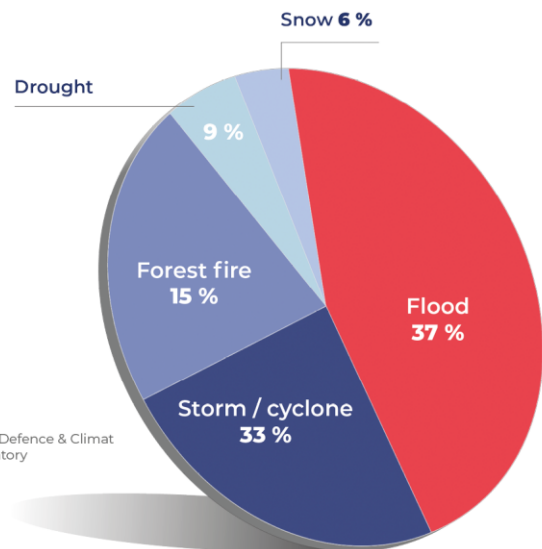
Source: Defence & Climat Observatory

*Military civil protection personnel are excluded. We only list the reinforcements of military personnel mobilized in support of civil protection forces.

Figure 12 shows the number of HADR operations carried out by armed forces in support of civil protection forces on French territory (including French overseas territories) over the period 2007-2023. This time, the aim is to list HADR operations carried out by military personnel under the authority of the Ministry of the Armed Forces. Based on open-source information, **34 interventions were recorded, and a 200% increase in the number of interventions was observed between 2007 and 2023.** Between 2007 and 2014, the average number of HADR operations carried out by armed forces in additional support of civil security forces was two per year. Over the period 2015-2023, it rises to 3.25, mainly because of a milestone being reached in 2022, with four interventions per year, an increase that will continue in 2023, with five interventions per year. **Given that the data collected cannot be considered exhaustive, and given the low number of interventions, a margin of uncertainty must be considered. However, based on the statistical laws relating to the fluctuation interval, it is 95% certain that the evolution over time of military HADR operations in support of civil security forces during climatic disasters does indeed correspond to an increase.** The reasons for this increase require further research, but we can speculate that it is partially attributable to an increase in frequency and intensity of climate-related disasters.

Figure 13 - Distribution of HADR operations by armed forces in response to climatic disasters by type of disaster (2007 - 2023), off ForMiSC*

In 2007 and 2023, **floods were the type of climate disaster that most frequently mobilised reinforcements from armed forces (37% of cases).** For example, in 2014, several regiments, including more than 235 military personnel, were urgently deployed following floods in the Var (Armée de Terre, 2014). **Cyclones and storms are the second most common type of disaster for which armed forces are called in for support (33% of cases).** In 2009, Storm Klaus, which struck Aquitaine and Midi-Pyrénées, led to the **deployment of 750 military personnel to support civil protection units (État-major des Armées, 2009).** More recently, in November 2023, Storm Ciarán devastated agricultural fields in the West and North of France, **where the Brest-Loperhet air detachment contributed to the restoration of affected agricultural lands in the commune (Armée de l’Air et de l’Espace, 2023).**



Source: Defence & Climat Observatory

* Military civil protection personnel are excluded. We only include reinforcements of military personnel mobilized in support of civil security forces.

Data presented above must be used with caution: they are not exhaustive, and sometimes come from open-source selection that cannot, under any circumstances, reach the degree of exhaustiveness of an institutional census; moreover, data concerning the commitment of ForMiSC on the national territory (figures 10 and 11) were only obtained over a period of ten years. The analysis of this commitment over a wider time window, for example over a period of twenty or thirty years, could lead to different results.

However, if we look at the period 2014-2024, the climate pressure exerted on ForMiSCs does not appear to be reflected in an increase in their HADR operations, but rather in **one-off peaks of activity, accompanied by the commitment of military technical reinforcements (land and air means)**. Contrary to the impression that ForMiSCs are increasingly being deployed in response to climate disasters, the mobilisation of these units did not increase in number or frequency over the period studied, which could be partly explained by a **strengthening of other components of civil protection**. This hypothesis is supported by the increase in the overall number of civilian civil protection personnel: from 232,551 in 2013 (including 40,237 professional firefighters) to 241,757 in 2022 (including 42,967 professional firefighters), according to the Ministry of the Interior and Overseas France in 2023. However, more comprehensive research is needed to support or refute this hypothesis, which is based on partial data.

The collected data also confirm **an upward trend in the frequency of HADR operations carried out by French armed forces on the national territory in support of civil protection forces⁶ (military or otherwise)**, particularly for floods and storms. Since recorded commitments were not coordinated at a national level by the interministerial crisis management operational centre (COGIC), we deduce that they were requested by local authorities (local, departmental, zonal level). They highlight increasing climate pressure on military personnel and technical means, and the need to adopt strategic guidelines on the role played by armed forces in the context of disasters on French territory. Does the effective increase in HADR operations conducted by armed forces imply a reconsideration of their core business (waging war), or its reaffirmation in favour of a predominantly civil approach to climate insecurity on national territory? Furthermore, the absence of a national record of all these commitments seems to participate to the invisibility of armed forces' contribution to HADR operations, which may compromise the development of anticipatory thinking on the subject.

To address this lack, it **would be appropriate to establish a tool for recording military HADR operations**, which would enable information to be passed up from the most local levels to the national level. The Centre for Planning and Execution of Operations (CPCO) could be the body centralizing this data.

⁶ For more information on the legal and regulatory framework of HADR operations and HADR operations abroad, see Gros, P., Taithe, A., Thomas, A., Tourret, V. (2021). La contribution des armées aux interventions de secours d'urgence en catastrophes naturelles de grande ampleur. Fondation pour la Recherche Stratégique. Note n° 68/Consortium CONFLITS-2035. <https://www.frstrategie.org/sites/default/files/documents/programmes/observatoire-des-conflits-futurs/publications/2021/02.pdf>

3. Challenges and operational limits: the risk of a capability breakdown⁷

The increase in frequency of armed forces' commitment to contribute to HADR operations, demonstrated in the previous section, implies specific requirements in terms of operational capabilities and adaptation (Palle & Jolly, 2020). This translates into greater pressure on military engineering functions⁸ and logistical support, with increased use of the military air assets. In overseas territories, these pressures are multiplied, and are accompanied by greater mobilisation of the maritime vector.

A – The metropolitan area

Climate change is accentuating meteorological contrasts in mainland France: heavy rainfall is expected to increase in the north, and warm nights, approaching a tropical climate, in the south - for up to 66 days a year. Forest fires, meanwhile, are likely to occur more frequently throughout the country, with a longer fire season (Schwarz, 2024). In the face of these tougher weather conditions, maintaining rescue capabilities can only be guaranteed by continually adapting the forces, who must be prepared to intervene more frequently throughout France (Cour des Comptes, 2024). This operational imperative has been considered by the civil protection authorities, and has resulted, for example, in the **creation of a fourth Civil Protection Training and Intervention Unit (UIISC) in Libourne** (Nisslé, 2024)⁹. In this section, we will focus on **two operational components directly involved in HADR operations on French territory: the air means and the engineering function of armed forces.**

Air means

The increasing number of climate disasters could lead to greater use of military air assets for rescue missions, particularly in the event of flooding. (Nisslé, 2024). The responsiveness of air assets makes them one of the first resources to be called upon: during the floods in the Var region in June 2010, military air resources were called upon as soon as the first warning messages were received from Météo-France (Collombat, 2012). They can provide rapid access to areas rendered impassable and inaccessible by a natural disaster, as well as convoying large loads of equipment or vehicles (Gros et al., 2021; Collombat, 2012; Défense Zone, 2021).

⁷ See definition in the glossary.

⁸ See definition in the glossary.

⁹ The installation of this UIISC will begin with the arrival of 160 personnel in the summer of 2024, to reach the target of 580 personnel and 250 vehicles by 2027 to fight forest fires. The military personnel of this unit, as well as those of the three other units, are attached to the French Land Army (Guyot & Ministry of Interior, 2024).

Most frequently used aircraft for emergency assistance and rescue in mainland France are transport helicopters (the Puma, Caracal, Fennec, Caïman), used for search and rescue missions, evacuation of injured people and delivery to hard-to-reach areas¹⁰. **Military transport aircraft, such as the A400M, are increasingly used for large-scale rescue operations**, particularly airlift operations. As part of Operation Resilience, several A400M carried out a few medical evacuation missions to relieve overcrowding in hospitals in the Paris region. They have also been upgraded with a resuscitation medical airlift kit for transferring patients (Armée de l’Air, 2023). A removable kit that enables A400M to carry and drop the equivalent of 20 tonnes of water - three times more than a Canadair¹¹ - has also been tested by Airbus in response to forest fires (Haehnsen, 2023). **The adaptability of these aircraft means they can be deployed in times of capacity constraints.**

The growing demand for airborne resources for HADR operations is perfectly illustrated by the **revision, in the spring of 2023, of Operation Héphaïstos¹² to fight forest fires** following the scale of the fires in summer 2022 (État-major des armées, 2023). This operation is equipped with a detachment of three helicopters specialised in manoeuvres and reconnaissance, to meet the needs of civil security in terms of mobility and surveillance. The Gazelle, as a light helicopter, as well as the Cougar and the Puma, are on permanent alert. The review of the operation includes an **extension of the intervention period and zone, from around twenty départements to the whole of mainland France** (IHEDN, 2023; État-Major des Armées, 2023). Although this revision does not include the reinforcement of seconded airborne resources, this could prove necessary in the future: by 2050, half of the wooded and forested areas in mainland France could be exposed to a high risk of fire, compared to one third of these areas in 2010 (Croix-Rouge française, 2024).

The role of military engineering

The proliferation of HADR operations in the context of climate-related disasters, which are by their very nature interventions in degraded environments, is also leading to an increase in the military role of engineering. The "ability to rapidly transport troops and equipment into areas that are difficult to access" is becoming a crucial capability (Palle & Jolly, 2020, p.97). For example, during storm Alex, which hit the Alpes-Maritimes in October 2020, the equivalent of three months' rain fell in 24 hours, and gusts of 180 km/h caused major damage (Météo-France, 2020). Military engineering units were rapidly deployed to support civil protection, mainly in the Vésubie and Roya valleys in three groups

¹⁰ For example, four armed forces helicopters were deployed during storm Xynthia to transport 700 kilograms of freight, including generators, drinking water and emergency equipment ((État-major des armées, 2010).

¹¹ A Canadair is a water-bombing aircraft designed specifically for extinguishing forest fires.

¹² Operation Héphaïstos has been a permanent mission of the French armed forces since 1984, involving military resources in the fight against large-scale forest fires. The operation involves two adapted surveillance modules (MAS), three engineering sub-groups, an air and space force detachment (AAE), a detachment of three army helicopters and four military reinforcement sections (Alat, n.d.).

(État-major des armées, 2020a). The air-land sub-group carried out **evacuation missions and transported essential equipment** in vehicles in isolated areas, as well as an air bridge between Nice and the Roya valley (État-major des armées, 2020b). The second sub-group, made up of 1^{er} Régiment étranger du Génie (REG), 19^e Régiment du Génie (RG), and 3^e Régiment d'artillerie de la Marine (RAM), carried out **clearing and logging missions, and reconnaissance of alternative routes** (État-major des armées, 2020a). Finally, the last sub-group, made up of the 1^{er} REG and equipped with off-road trucks, provided **logistical support**. These technical, logistical and operational support efforts reflect the key commitment of armed forces' engineering units to the success of rescue operations.

The operational exercise of engineer units is inseparable from the use of a diversified and versatile fleet of vehicles to provide appropriate assistance to disaster-stricken populations. The crossing equipment¹³ can be used to cross a river to allow wheeled vehicles to pass (Ventura, n.d.). To facilitate the deployment of emergency aid, French armed forces can prepare land with public works equipment¹⁴. During Storm Alex, for example, they used rapid protection engineering equipment (EGRAPs) to reopen 2,400 metres of road in a muddy environment (Etat-major des armées, 2020b). GBC 180 tactical vehicles, multi-purpose trucks, can also be used to transport personnel and freight (Armée de Terre, 2021). Eleven of them, for example, transported water pallets in the early days of Storm Alex. **Engineering units are spread across almost all over mainland France. Most of them are in the south of France and the Île-de-France region, compared with coastal areas and the centre of the country, which are not which are not spared from climatic risks¹⁵.** In the event of several unpredictable and violent climatic events occurring simultaneously in several regions, the current geographical layout could compromise the responsiveness of units in the least well-equipped regions. **A reassessment of the location of engineering units could enable them to be positioned more strategically to meet the specific challenges of each region and thus avoid operational gaps.** In addition, adapting available resources to units so that they respond appropriately to local risks could be a relevant lever for reducing the risk of capability disruption.

¹³ The motorised floating bridge (PFM), the front-end crossing machine (EFA), bridge-laying tanks and the rapid span-laying system (SPRAT).

¹⁴ These include the engineer tank, the armoured engineer vehicle (AEV), which clears and prepares the way for other vehicles. The multi-purpose engineering equipment (MPG), which is a tractor-loader, or the multi-purpose deployment aid machine (EMAD), a backhoe loader, can clear the ground. The backhoe loader, known as the rapid protection engineering machine (EGRAP), is often accompanied by a development engineering machine (EGAME).

¹⁵ Risks of flooding, water stress (see definition in glossary), storms and heatwaves (Croix-Rouge française, 2024).

Risk culture

The risk culture¹⁶ is based on two pillars: understanding the risks facing the country and developing the capacity to anticipate and prepare for climate disasters. According to Lieutenant-Colonel Stéphane Nisslé, Chief of Staff of the Command of Civil Protection Military Units (ComForMiSC), **developing this risk culture within the population is one of the main ways of delaying the risk of capacity disruption. The knowledge of the behaviour to adopt before or at the time of the event helps to reduce the effects of the phenomenon** (Nisslé, 2024). The better prepared the population is for climate disasters and the more aware they are of good practice in emergency situations, the lower the risk of overloading emergency capacities. However, **the risk culture of the French population, especially in mainland France, remains extremely weak**. Two-thirds of the French population, i.e. **44 million people¹⁷, are potentially exposed to the risk of flooding, but 75% are not aware of this or are not properly prepared** (Croix-Rouge française, 2024). During the floods in June 2016, mayors and prefects had difficulty convincing people to evacuate their houses. **Greater investment by politicians and emergency services in building a culture of risk among the population could have encouraged victims to follow evacuation instructions and facilitated the work of emergency services** (Perrin et al., 2017). When storm Xynthia struck in 2010, the Prefect of the Vendée region also deplored the lack of a risk culture, this time among elected representatives, who had shown themselves to be very unresponsive during the warning phase (Anziani, 2010).

This lack of risk awareness is reflected in the population's heavy dependence on emergency services, but also in risky behaviour in the event of a disaster - for example, leaving the house or walking along the seafront during storm and flood warnings - which also increases the burden on the civil protection forces. In 2021, the fire brigade carried out 4,680,900 interventions, including a 12% increase in emergency assistance to individuals compared with 2020, particularly in connection with climate risks such as drought and flooding (ministère de l'Intérieur, 2021). At the same time, the French Red Cross notes that between 2012 and 2024, **the time taken by volunteers to respond to weather-related disasters has doubled, reflecting an increase in weather-related disasters and a greater need to support victims** (Croix-Rouge française, 2024). Part of this growing burden on emergency services could be mitigated by the development of a risk culture, i.e. greater discipline and autonomy on the part of the population in the event of a disaster. This would benefit not only civil protection forces, but also armed forces, which are often mobilised when the former are overstretched. Conversely, this risk culture is very present in some overseas territories, among the population, elected representatives and institutions, particularly in territories prone to tropical storms. Local people are trained in how to behave in the event of a cyclone and are also made aware of the (rare) risk of a tsunami. Similarly, military units posted to New Caledonia, French Polynesia, Réunion and Martinique are made aware of the risk of cyclones as soon as they arrive and undergo regular training during their posting using simulations.

B – Overseas territories

The feeling of exposure to climate risks is greater in overseas territories than in mainland France (Ministère de la Transition écologique et de la cohésion des territoires, 2022). This contrast is partly explained by a physical reality: overseas territories are the French territories most affected by climate change (ONERC, 2012), and their vulnerability is all the greater because they are, often, island territories with limited means and resources. In addition to extreme droughts and forest fires, the frequency of cyclones is also expected to increase, particularly in the Antilles and Réunion, with major cyclones having a return period of 23 years in Réunion and 34 years in Guadeloupe (Météo France & Risk Weather Tech, 2020). Because of the geographical remoteness of French overseas territories, **anticipating operational requirements for disaster response and population relief must, for these**

¹⁶ See definition in the glossary.

¹⁷ The French Red Cross gives a higher figure than the Ministry of Ecological Transition and Territorial Cohesion, because it considers all built-up and inhabited areas subject to landslides, flooding, river overflows, run-off, marine submersion or rising water tables.

territories much more than for mainland France, incorporate the need for autonomy and operational redundancy.

Insufficiently pre-positioned forces

In the face of growing climate insecurity¹⁸, civil protection forces and resources are proving insufficient in overseas territories. For example, the ratio of firefighters per 1,000 inhabitants is between 2 and 3 for the three French territories in the South Pacific, compared with 3.7 for France as a whole (Arnell, 2018a)¹⁹. In this area, civil protection resources are very limited, as shown by the low number of civil protection personnel at the French Polynesian High Commission²⁰ (8), including only 4 firefighters (Taithe, 2024). In Martinique, there are 259 professional firefighters and 894 volunteer firefighters for a population of almost 380,000, a ratio of 3.7 per 1,000 inhabitants, making it one of the best-equipped overseas territories. Conversely, some territories are completely under-resourced: there are only 17 firefighters in Wallis and 12 in Futuna, with a single truck and ageing, poorly protected infrastructure, giving a ratio of 2.4 firefighters per 1,000 inhabitants (Arnell, 2018a). In France, between 2018 and 2023, the ratio of firefighters rose from 3.7 to 3.9 per 1,000 inhabitants, an increase of 0.2 points (Nisslé, 2024).

¹⁸ See definition in the glossary.

¹⁹ For more details on the deployment of civil security forces in the overseas territories of the Pacific, see Defence and Climate Observatory study report no. 7 (Alex et al., 2019).

²⁰ One of the Haut-Commissariat's roles is to manage crisis units for extreme weather events, such as cyclones, and to identify and assess civil security risks of all kinds (Haut-Commissariat de la République en Polynésie française).

Figure 14 - Fire and rescue service and armed forces personnel in overseas France in 2018

	Professional firefighters (including military)	Volunteer firefighters	Total fire brigade	Fire brigade ratio per 1,000 inhabitants	Military (2021 figures)	Military personnel per 1,000 inhabitants
Guadeloupe	330	1,452	1,782	4.6	1,100	1.4
Martinique	259 (2021)	894 (2021)	1,153 (2021)	3.7		
French Guiana	221	663	884	3.2	2,100	7.4
Réunion	883	1,268	2,151	2.5	1,700	1.4
Mayotte	218	416	634	2.5		
New Caledonia			760	3.0	1,650	6.0
French Polynesia	249	379 (2021)	627	2.3	1,250	4.0
Wallis and Futuna			29	2.4		
France as a whole (including military firefighters)	55,000 (2021)	197,800 (2021)	252,700 (2021)	3.7 (2021)	30,000	0.4

Sources: Arnell, 2018a ; État-major des armées, 2021, juin ; ministère de l'Intérieur, 2023.

In this context, the support of armed forces is crucial for civil protection. However, the human and material resources of armed forces prepositioned in overseas territories barely meet current needs, which is even more problematic because these territories are far from mainland France, and it takes an extremely long time to send reinforcements from mainland France²¹. According to a Senate report, these resources, both material and human, are inadequate and undersized given the size of the overseas geographical area and the various roles and missions assigned to armed forces overseas, in a geopolitical context of competition between powers, particularly in the Pacific (De Legge, 2022). This undersizing jeopardises their ability to deal with various crises, in the field of security and defence, as well as in the humanitarian field (Cambon, 2019). This is illustrated by Hurricane Irma, which hit the Antilles on September 5, 2017, and which "revealed a lack of reflection on the pre-positioning of forces" according to an information report by the Senate Delegation for Overseas France (Arnell, 2018, p.16). This event also led to the mobilisation of forces from mainland France at a time when they were already being called upon to fight forest fires in the south of France (Nisslé, 2024). **Although a capability breakdown was avoided, this situation needs to be considered strategically and preventively, as such situations of overstretch during simultaneous climatic disasters are likely to recur.**

²¹ There are 1,100 military personnel in the French West Indies, 1,250 in French Polynesia and 1,650 in New Caledonia (ministère des Armées, 2023).

One way of strengthening forces could be to develop the Adapted military service (SMA), a military social and professional integration scheme that trains around 6,000 volunteers a year. These volunteers are trained in manual jobs, particularly in construction, electricity, transport and mechanics, as well as in first aid and disaster evacuation. This gives the SMA a key role in HADR operations overseas during climate disasters. For example, it was mobilised in support of the armed forces in Guadeloupe, Martinique and Saint-Martin during hurricanes Irma and Maria in 2017 to provide assistance and relief to the population (Arnell, 2018b). **Strengthening the SMA's manpower and logistical capabilities could be a relevant lever for consolidating the resources pre-positioned in overseas France, which could easily be mobilised in the event of a climate disaster.**

Developing strategic operational capabilities

The occurrence of Irma in 2017 not only highlighted the region's heavy dependence on reinforcements, but also on-air resources from mainland France. An air bridge requiring significant logistical resources was put in place, involving the use of the A400M. However, this did not arrive until September 10, 2017, five days after the cyclone hit Saint-Barthélemy and Saint-Martin²². The *Bâtiment de Projection et de Commandement* (BPC) Tonnerre also left Toulon on 13 September and arrived in the Antilles on 23 September, carrying more than 1,000 tonnes of equipment and more than 500 military personnel (Zone militaire, 2017, 13 September).

While air capabilities are essential for HADR operations in overseas territories, in most of these territories, sovereignty forces have limited air projection resources. On Réunion and Mayotte, the Armed Forces of the Indian ocean south region (FAZSOI) have two CASA transport aircraft, one of which is usually under maintenance (Taithe, 2024). The Armed Forces in French Polynesia (FAPF) have the same problem with CASA transport aircraft, and only have an A400M aircraft at their disposal for a few weeks a year (Forces armées en Polynésie française, 2024). Because of the limited number of air assets available, **the increasing number of climate-related natural disasters is likely to lead to more and more frequent calls on air assets from mainland France - with the delays that this entails - or on foreign assets, to the detriment of the strategic autonomy of the French forces.**

In terms of equipment, the amphibious capability²³ also lacks in French overseas territories, even though it is an essential capability for HADR operations overseas. French armed forces have initiated

²² The Prefect of Martinique explained the delay by the fact that flights were halted from Tuesday 5, September to Thursday 7, September, it was impossible to land a jumbo jet on the runway at Grand-Case airport, and then air traffic was halted again from 8 to 9 September due to Hurricane José. The A400M was dispatched on the 10th, as soon as it was confirmed that Juliana airport was able to receive it (Préfet de Martinique, 2017, September 10).

²³ See definition in the glossary.


the **disarmament of BATRALs** (light transport vessels), which had a beaching capacity²⁴, enabling them to land on coastlines where there were no quays. They have been replaced by multi-mission ships (B2M) subsequently renamed overseas support and assistance buildings (BSAOM) which do not have this capability²⁵, which means longer delivery times and less carrying capacity. **As a result, there is currently a real shortfall in the Navy's amphibious capabilities in French overseas territories**²⁶.

Finally, all French overseas territories are vulnerable to cyclonic risks. It is therefore crucial to **strengthen the cyclone resistance of the various military and administrative infrastructures**, so that they can be operational in the event of a humanitarian need. In Saint-Martin in 2017, hurricane Irma partially destroyed the prefecture and damaged the fire station, the airport and the gendarmerie, making it more difficult to mobilise and coordinate civil protection services for rescue operations. The project for a new command post in French Polynesia, adapted to anti-cyclonic standards, is part of an infrastructure adaptation effort that must be extended to all ultra-marine territories. More generally, this issue has been considered in the Climate & Defence strategy adopted in 2022, as demonstrated by the launch of a project to map the climatic vulnerabilities of French military bases.

²⁴ See definition in the glossary.

²⁵ They have retained a small capacity for getting ashore using their flat-bottomed service boat (which can carry a small "bobcat" type worksite vehicle or a small off-road vehicle).

²⁶ LOI no. 2023-703 of 1 August 2023 on military programming for the years 2024 to 2030, paragraph 2.2.3, available at: www.legifrance.gouv.fr.



II – HADR OPERATIONS ABROAD IN RESPONSE TO CLIMATE DISASTERS: A GROWING LEVER OF INFLUENCE AND POWER

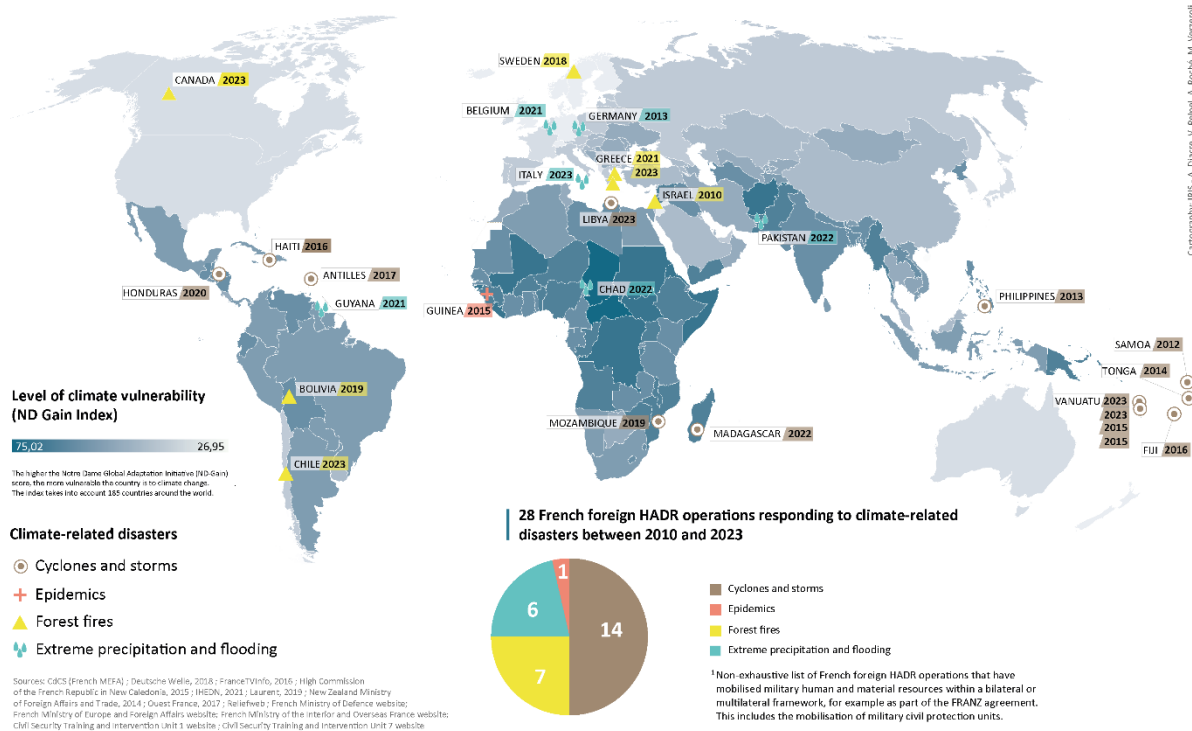
1. The international ecosystem of HADR operations abroad in response to climate-related disasters

To map the international ecosystem of HADR operations abroad in response to climate-related disasters, the Defence and Climate Observatory has compiled a list of **all operations carried out by France and by four other States considered to be leaders in the field, or of priority interest for French strategic issues: Australia, China, the United States (US) and India**²⁷. This inventory was conducted, for most part, on information available in open sources, and cannot be considered exhaustive. Data has also been collected on other European countries but it is not included in the mapping work because of their low investment in HADR operations abroad. This is particularly the case for Germany, the United Kingdom, Greece and Spain.

A - France

Figure 1

France's foreign humanitarian and assistance disaster relief (HADR) operations in response to climate-related disasters (2010-2023)¹



HADR operations abroad in response to climatic disasters do not seem to be a specific focus for most European countries, especially when it comes to interventions outside the framework of European solidarity. Between 2010 and 2023, for example, there were only four interventions conducted by

²⁷ The aim was also to select powers positioned in the HADR operations abroad field in the Indo-Pacific region, which is particularly vulnerable to climatic disasters.

Spain, including two in Chile, one in Portugal and one in Libya, and five by Greece, including two in Montenegro, one in Israel, one in Bosnia-Herzegovina and one in France. Germany and the United Kingdom are perhaps the most heavily involved, with nine climate-related HADR operations abroad each, except for France, which stands out from the rest of Europe for its investment in this area. **Between 2010 and 2023, France has been involved in at least 28 HADR operations abroad in response to climate-related disasters.** France is relatively evenly positioned in the response to **three main types of disasters.**

Firstly, France intervenes mostly for **cyclone and storm disasters (14 operations)**, mainly in the **Caribbean islands and Central America** (Honduras), **South Africa** (Mozambique, Madagascar), and **the Pacific** (Philippines, Vanuatu, Tonga, Fiji), with relief operations set to play a central role in France's strategy for the region in the future. During his tour of the Pacific in July 2023, President of the Republic Emmanuel Macron specifically emphasised the structuring nature of climate change in the Pacific, and highlighted France's legitimacy in this area, particularly in terms of maritime surveillance and emergency relief. On that occasion, he announced the establishment of a Pacific Academy in Nouméa (New Caledonia), a military academy whose main objective is to strengthen the Indo-Pacific axis by working with partner States in Oceania. This is illustrated particularly by the training of Oceanian security and defence forces in emergency relief, as well as the creation of a reinforced relief coordination centre, in cooperation with the Red Cross.

France is also involved in responding to forest fires, mainly in Europe (Greece, Sweden) and South America (Bolivia, Chile), as well as **extreme rainfall and flooding**, mainly in Europe (Belgium, Germany, Italy). When they are carried out in Europe, these HADR operations abroad in response to climate disasters are most often carried out within the framework of the European Union's Civil Protection Mechanism²⁸, as in 2018 during the intervention in Sweden to respond to forest fires, or again in 2023, during the French intervention in response to forest fires in Greece and floods in Italy. The European Union has strengthened this Mechanism by creating the rescUE in 2019, a reserve of European capabilities that includes bomber and transport aircraft and helicopters, medical and health supplies, as well as shelters and transport, logistics and energy supply equipment (European Commission, 2023).

On the African continent, France's main area of expertise remains the response to cyclones, particularly in Mozambique in 2019 and Madagascar in 2022, with occasional interventions in response to floods, such as in Chad in 2022, and to an epidemic in Guinea in 2015.

²⁸ At the end of 2001, the European Commission set up the European Union Civil Protection Mechanism, the aim of which is to strengthen civil protection cooperation between the countries of the European Union and 10 other Member States participating in the Mechanism, with a view to improving disaster prevention, preparedness and response (Commission européenne, 2024).

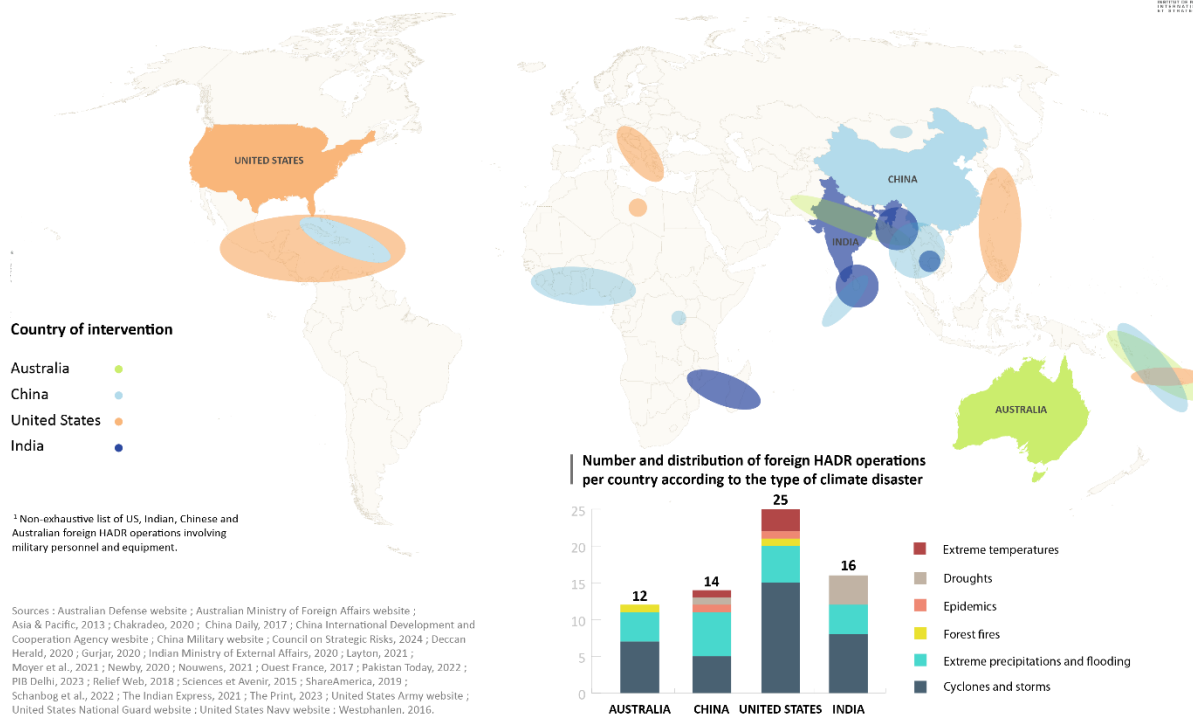
B - The international ecosystem of HADR operations abroad

Figure 2

Main projection areas for Australia, China, the United States and India for foreign humanitarian and assistance relief operations in response of climate-related disasters (2010-2023)¹



Cartography: IRIS - A. Diacro, V. Pelegh, A. Roché, M. Ventrone



THE UNITED STATES

The international ecosystem of climate HADR operations abroad is largely dominated by the United States (US), which has twice as many HADR operations abroad as Australia, China and India (25 climate HADR operations abroad between 2010 and 2023), according to a survey carried out by the Defence & Climate Observatory. They also stand out for the variety of climate disasters to which they respond and for the versatility of their capabilities, which include responding to cyclones, extreme precipitation and flooding, extreme temperatures, forest fires and epidemics. US leadership in this area is consistent with the attention paid by US defence policy, since the early 2000s, to disaster relief, which is seen as an essential mission for armed forces, and to climate change, which was very quickly recognised as a major security and operational issue (Capie, 2015). At the same time, the US perception of the use of military force has also evolved. While coercion remains an essential component of military power, its usefulness in relations with most other States has been reduced. The growing importance of non-coercive missions, also known as "military operations other than war" (MOOTW), such as population relief operations, reflects this strategic reassessment (Auslin, 2012).

While their HADR operations abroad are frequent and various, the US also stands out for the diversity of the geographical areas in which it operates. In particular, it has frequently intervened in **Latin America and the Caribbean** (in Haiti, Saint-Martin, the Bahamas, Panama, Guatemala, Honduras and Mexico), in **Southern and Central Europe** (Greece, Slovenia and Montenegro), as well as in **Central and South-East Asia and the South Pacific**.

Since the 1990s, **the US has been the main provider of emergency humanitarian aid²⁹ in the Indo-Pacific region**. Between 1991 and 2023, US armed forces responded to some forty natural disasters in 17 countries in the region (Grare & Levallant, 2023). Over the period studied (2010-2023), the Defence & Climate Observatory counted 12 interventions specifically in context of natural disasters of climatic origin. To respond to these disasters, the US has considerable human and military resources at its disposal: the US Indo-Pacific Command has more than 2,000 aircrafts, 200 ships, 100 submarines and more than 370,000 armed forces personnel who can be mobilised to respond to disasters (Grare & Levallant, 2023). Between 2010 and 2023, the United States intervened very frequently in the Philippines (five interventions recorded), and to a lesser extent in Pakistan, Thailand, Japan, South Korea and Vanuatu, mainly in response to cyclones and floods. More generally, for the US, it is a question of projecting itself as a committed and legitimate regional power in East Asia and the Pacific, in line with the Obama administration's efforts to "pivot" American forces towards Asia³⁰.

INDIA

For a long time, a beneficiary and not a provider of aid, **India has positioned itself as a rising power in the field of HADR operations abroad over the last decade**. Over the period studied, there were 16 HADR operations abroad in the context of climate disasters. These were implemented in response to cyclones and storms, extreme precipitation and floods, and droughts - a field of expertise that for the moment appears less diversified than that of the US or, as we shall see, China. At first glance, most of these interventions remain within India's geographical "backyard", in line with its 'priority neighbourhood' policy (Jayaram, 2020): in South Asia, with interventions in Bangladesh, Sri Lanka, Myanmar and Afghanistan, and a single intervention in the Pacific, in Fiji. During the most recent HADR operations abroad, in 2023, the Indian Navy quickly delivered 40 tonnes of aid equipment to Myanmar following Cyclone Mocha. India also leads the Bay of Bengal Multi-Sectoral Technical and Economic

²⁹ See definition in the glossary.

³⁰ According to some observers, the US reengagement in the region even predates the 'pivot' policy: the reorientation of US military resources towards Asia began in the mid-2000s, with the aim of increasing the combined power of the United States and its allies and partners in Asia, and dissuading China from seeking hegemony (Silove, 2016).

Cooperation (BIMSTEC) initiative, which has great potential for disaster management, and hosted the BIMSTEC joint disaster management exercises in 2017 and 2020³¹.

However, India's ambitions for HADR operations abroad appear to extend beyond its neighbouring countries. There are three Indian climate HADR operations abroad in Madagascar (in 2018, 2020 and 2021), and an HADR operation abroad in Mozambique in 2019 in the wake of Cyclone Idai, **demonstrating a desire to expand the areas of intervention**. This applies not only to HADR operations abroad in the context of climate disasters, but also in the context of non-climate natural disasters (for example, the Indian Air Force deployed a specialised search and rescue team, equipment, medicines and other humanitarian aid supplies to Turkey and Syria following the earthquake in February 2023), **as the country seeks to assert itself as a "first responder" to the various environmental or security crises that may emerge around the globe** (The Print, 2022). India's growing investment in HADR operations abroad is partly a reaction to China's growing presence in South Asia and the Indo-Pacific, as a means of offsetting Chinese influence in the region. However, some observers note that as both countries strengthen their HADR operations abroad activities in these regions, **the focus on competition may limit the scope for using humanitarian relief and disaster management as tools for diplomatic cooperation** (Banerji, 2023).

CHINA

Although China does not have a greater number of HADR operations abroad (14), like the US, **it stands out for the diversity of the disasters it responds to, which can include cyclones, extreme rainfall and floods, extreme temperatures and epidemics**. China, like India, regularly responds to droughts, while the US, like Australia, has stepped up its emergency response to forest fires, a type of disaster that China has yet to tackle.

China also intervenes over vast geographical areas. Several Chinese military emergency relief operations have taken place in the Caribbean, notably in 2017 in Cuba after hurricane Irma and in Dominica after hurricane Maria³². Much more reactive than the US, China was the first country to assist Haiti by delivering emergency medical equipment to combat Covid-19 in 2020. China's growing influence in the region is maintained by trade, a diplomatic policy of South/South cooperation, and

³¹ BIMSTEC's second disaster management exercise involved 80 delegates from Bangladesh, India, Myanmar, Sri Lanka and Nepal in a simulation using local resources to respond to flooded areas. A Weather and Climate Centre was also set up in 2018, as well as a workshop on building disaster warning systems.

³² China is also developing emergency aid funds and humanitarian cooperation in the event of extreme climatic events or major crises.

increasing investment³³. During the period under review, **China also conducted two HADR operations abroad on the African continent**: in 2019, the 22nd engineering team of Chinese peacekeeping troops in the Democratic Republic of Congo (DRC) repaired a "vital road" linking Kazanja to Butuza following extreme rainfall (FCSA, 2016). During the 2014-2016 Ebola crisis in West Africa, the People's Liberation Army (PLA) intervened in Sierra Leone, Liberia, Guinea and Guinea-Bissau. This was "the very first opportunity for China to demonstrate its willingness and ability to play a significant role in the management of health emergencies of international concern" (Cabestan, 2020). **While most of the humanitarian aid and emergency relief provided by China to Africa remains civilian in nature³⁴, the intensification of climate insecurity could, in the medium term, encourage China to establish a military presence there.**

However, it is in the Indo-Pacific region that **China has most increased its presence and contribution to humanitarian aid in its quest for leadership in the HADR operations abroad field**. This region is of major strategic interest to China, which is also geographically well-placed to facilitate its interventions. Between 2010 and 2023, there were **11 Chinese interventions in the Indo-Pacific** region in response to climate-related disasters - in Thailand, the Philippines, the Maldives, Sri Lanka, Laos, Vanuatu, Tonga and Burma, but **above all in Pakistan, where China is in direct competition with the US**. From June to September 2022, the country suffered extreme rainfall and massive flooding affecting more than 33 million people. The PLA deployed a Y-20 transport aircraft, which delivered 3,000 tents to the southern city of Karachi (Mang, 2022). This aid was the subject of several articles published by media controlled by the Chinese government, in a bid to promote China's humanitarian commitment. A ceremony to hand over humanitarian aid supplies was held in August 2022, with the Chinese ambassador to Pakistan and the Pakistani Minister for Electricity, to publicly show the recipient country's gratitude to China (Xinhuanet, 2022). These HADR operations abroad **are part of a Chinese desire to assert a new 'Asian security' order, and to assert itself as a regional security power, in opposition to a foreign US presence** (Capie, 2015).

³³ For more information on Chinese influence in the Caribbean, see the Defence and Climate Observatory note: De Guglielmo Weber (2023, September). La Chine face aux changements climatiques : une quête d'influence et de puissance écologiques. Observatoire Défense & Climat. <https://defenseclimat.fr/la-chine-face-aux-changements-climatiques-une-quete-dinfluence-et-de-puissance-ecologiques/>

³⁴ In 2019, for example, China provided food aid and relief to Namibia, South Sudan, Zimbabwe and Mozambique in response to food crises.

AUSTRALIA

The increased intensity and frequency of climate disasters in the Pacific has led to a growing involvement of Australian Defence Forces (ADF) in HADR operations abroad (Layton, 2021). Australia intervenes mainly in the Pacific islands (Fiji, Philippines, Solomon Islands, Vanuatu, Tonga, East Timor). HADR operations abroad are in fact a central pillar of security cooperation between Australia and the Pacific Island States, as was reaffirmed in the 2020 Defence Strategic Update (DSU) (Booth & Bachmann, 2023). In 2021, for example, 700 ADF personnel, an amphibious ship and several helicopters carried out an HADR operation abroad in Fiji following Cyclone Yasa. More recently, in 2023, Australia intervened following the passage of two tropical cyclones, Judy and Kevin, which hit Vanuatu less than 48 hours apart. The operation involved 600 ADF personnel, Air Force aircrafts, the deployment of HMAS Canberra, as well as personnel from the Disaster Assistance Response Teams (DART). **The priority regional dimension of Australia's climate HADR operations abroad is mainly motivated by a desire to contribute to regional stability, particularly in the South Pacific, and to cultivate multilateral partnerships, particularly with ASEAN** (Australian Government Department of Defence, 2016).

Despite this, there have been two HADR operations abroad in response to a climate disaster on the Asian continent: in 2010 in response to the floods that affected Pakistan, and in 2015 in Myanmar. The latter mobilised a Royal Australian Air Force aircraft, which delivered almost 1,000 family kits containing hygiene items, jerry cans of water, mosquito nets and educational materials. In 2018, Australia also sent a ten-strong DART to Greece, which carried out post-fire impact assessments alongside Greek authorities (Australian Minister for Foreign Affairs, 2018)³⁵. Here, **the triggering of this HADR operation abroad is not exclusively subject to strategic considerations linked to the State requesting aid, but also to operational considerations linked to the type of disaster that has occurred**. In this case, Australia has developed considerable expertise in fighting forest fires, due to the recurrence of this disaster on its territory. Similarly, the US, the country with the third highest average annual loss of forest hectares due to fire in the world (behind Russia and Canada), supported Greece in 2023 and Australia in 2020 in response to forest fires (Statista, 2023). Conversely, China and India do not intervene abroad for forest fires but have developed considerable expertise in drought management. **The management of climate hazards specific to a national territory is a vector for improving the know-how of armed forces in terms of HADR operations. These skills can then be a real strategic asset when it comes to providing assistance abroad** (Pina, 2024). These distinctions in terms of experience and expertise can be structuring factors in the distribution of HADR operations

³⁵ These teams are attached to Fire and Rescue New South Wales and Victoria Fire and Emergency Services.

abroad on an international scale, depending on the country requesting aid and the type of disaster for which it requires this aid.

2. HADR operations abroad in the context of climate disasters as a lever of influence

The increase in the frequency and intensity of natural disasters because of climate change will increase the need for emergency humanitarian aid in the future (IARAN et al., 2017). In this context, the ability of States to deploy military resources for foreign HADR operations is becoming a structuring soft power tool, making it possible to improve their reputation and influence with the populations and/or governments of disaster-stricken countries.

A- Reputational gains

The speed with which States respond to climate disasters, which is primarily a factor of humanitarian effectiveness, is also becoming a factor of influence in global competition (Grare & Levailant, 2023). **States wishing to use HADR operations abroad in this way must not only position themselves as responsive interlocutors, but also as well-intentioned ones.** For the State providing aid, this means disguising its strategic intentions³⁶ and adopting a disinterested and altruistic stance that can generate a positive image. Significant reputational gains have been observed following three American HADR operations abroad conducted in East Asia between 2004 and 2013 (Capie, 2015). Firstly, in 2004, a tsunami violently hit the Indian Ocean, in particular Indonesia, Thailand, the Maldives and Sri Lanka. Following the American intervention, a poll conducted in Indonesia showed almost immediate gains in popularity for the United States. Then, polls conducted after the 2011 earthquakes in Japan also noted record levels of public sympathy with regards to the US. Finally, in 2013, the same phenomenon was observed following the US intervention in the Philippines in response to Typhoon Haiyan. In all three cases, **the US military's rapid, comprehensive and effective response to a natural disaster appears to have significantly enhanced Washington's reputation among the affected population.**

It should be noted, however, that it is difficult to be certain of the causal variables between the occurrence of a disaster, the achievement of reputational gains, and the achievement of gains in

³⁶ This dimension is even more structuring given that the use of HADR operations abroad for strategic objectives contradicts the humanitarian aid principles governing disaster response. In 1994, the Oslo Guidelines on the Use of Foreign Military and Civil Defence Assets in Disaster Relief defined that "humanitarian assistance shall respect the basic humanitarian principles of humanity, impartiality and neutrality" (Nations Unies, 2007). Thus, linking the humanitarian response to a natural disaster to the activity of a government can compromise the vital principle of independence (Yim, Callaway et al., 2009).

diplomatic influence, insofar as many variables come into play, such as the geopolitical concerns of the disaster-stricken State, its political regime and economic situation, its relations with the donor State, the presence or absence of tensions and/or conflicts in the region, etc. In the context of the US interventions mentioned above, reputational gains must be seen in the wider context: in the Philippines and Indonesia, military emergency aid was part of a sustained long-term US development aid policy. Moreover, in the case of the Philippines and Japan, positive views of the US were probably helped by growing concerns about the possibility of conflict with China over disputed territories in the East and South China Seas (Capie, 2015). **Finally, while reputational gains among the disaster-stricken population have been noted, they have not necessarily made it possible to measure a gain in the United States' diplomatic influence or competitiveness with the disaster-stricken States.**

B- Disasters diplomacy

The expansion of soft power on the part of certain States in relation to populations affected by extreme climate events is a significant geostrategic asset. **States such as the US and China seek to implement 'disaster diplomacy' in the hope that their disaster-related actions (prevention, mitigation, response, humanitarian aid, etc.) have the potential to improve relations at national and international level** (Yim et al., 2009; Kelman et al., 2016).

This diplomacy can be conducted with allied and partner countries, thus fulfilling a **form of duty of solidarity that would be induced by close diplomatic relations**. This humanitarian support between allied powers makes it possible to maintain political cooperation between States, but also in terms of security (Canyon & Ryan, 2021). For example, member States of the European Union call on each other in the event of natural disasters, within the formalised framework of European Union's Civil Protection Mechanism, reinforced in 2019 by the rescUE mechanism, a reserve of European civil and humanitarian capabilities. Sweden, for example, called on the mechanism during the violent forest fires in 2018 (Commission Européenne, 2022), as did France in 2022 (Ambassade de France en Grèce, 2021) and Greece in 2023 (Chrisafis, 2021). Conversely, **if a State finds itself unable to come to the aid of a stricken partner State, this may result in a deterioration in its influence and diplomatic relations**. This inability may be perceived as a deliberate refusal to intervene, or as a lack of anticipation of climate crises, preparation and operational skills.

Disaster diplomacy can also be used as a means of **strategic projection towards States outside its areas of influence, to extend security cooperation and become more geopolitically competitive** (Canyon & Ryan, 2021). Since the early 2010s, for example, China has doubled its efforts to assert its role as a major power on the African continent. This strategy, motivated in part by the need to secure

China's energy supplies (Copinschi et al., 2019), is reflected in the dissemination of its economic and political model, the construction of a network of partner States, the strengthening of economic partnerships, the massive construction of infrastructure, the development of a humanitarian policy and the expansion of its military presence, illustrated by the establishment of its very first Chinese naval base abroad in Djibouti in 2017 (Rolland, 2022). Beijing **favours one-off interventions in the event of natural disasters, rather than comprehensive strategies to resolve and prevent crisis situations over the long term, to achieve rapid effects and use crisis situations for the purposes of influence (Gong, 2021).**

Disaster diplomacy: disputed effectiveness

Disaster-related activities create neither new conflicts nor new opportunities for collaboration or initiatives to achieve peace or reduce conflict, whether at sub-national, regional or international level (Streich & Mislán, 2014). Thus, most geographical and thematic case studies - such as health interventions (Kelman, 2019) - and theoretical analyses of disaster diplomacy describe the **general failure of this form of diplomacy** (Kelman, 2012). However, some researchers argue that in the short term, **disaster-related activities can have an impact on diplomacy**, for example by stimulating it or creating a space in which peace efforts can be pursued (Kelman, 2014; Mandel, 2002). For this to happen, a **pre-existing base - cultural or economic ties, ongoing negotiations - must be present so that the climate event becomes a catalyst for diplomatic action**³⁷. However, **this possibility is not systematically realised, as factors unrelated to disasters - such as geostrategic concerns, changes in leadership, historical mistrust or grievance - always exert a greater influence on diplomatic relations than disaster-related activities**. In 2023, Morocco turned down offers of humanitarian aid from several countries, including France for political reasons, after the violent earthquake that hit the south of the country³⁸. This episode could have been an opportunity for the two countries to renew their ties, but geostrategic considerations prevailed. Another example: in the Indian Ocean, interventions as part of the FRANZ coalition have certainly restored the image of Western countries in the Pacific, but they have done nothing to curb China's influence in almost all the countries that have benefited from FRANZ operations (Grare & Levallant, 2023).

³⁷ One example of the use of a climate event as a catalyst for diplomatic action is the Aceh region of Indonesia (Kelman, 2014). When a devastating tsunami hit the region at the end of 2004, this region was divided between separatists who had been demanding independence from Indonesia for decades. While the Indonesian government expressed its desire to reach a peace agreement, the disaster and the ensuing national and international political mobilisation created a political space more conducive to reconciliation. An international consensus emerged that the emergency created by the tsunami was an excellent opportunity to encourage peace talks (Gaillard, Clavé et al. 2008). This consensus took form, and a memorandum of understanding was signed, heralded as a peace agreement, which is still in force today.

³⁸ Diplomatic relations between France and Morocco have become increasingly strained in recent years, for several reasons. Firstly, France does not recognise Moroccan sovereignty over the Western Sahara, notably because the government is seeking to improve its relations with Algeria. In addition, the French government has restricted visa facilitation to Moroccans as part of its migration policy. Finally, the Pegasus affair has further tarnished relations, with President Macron having been eavesdropped on by Moroccan intelligence services (Oumansour, 2023).

3. HADR operations abroad in the context of climate disasters as a lever of military power

A – The challenge of military power

HADR operations abroad are special soft power tools, since they mobilise armed forces. They can therefore be referred to as "**smart power**" tools, a concept developed by Joseph Nye to describe strategies that combine "soft" and "hard" power, i.e. use both military and civilian resources and therefore combine coercion, force, diplomacy and attraction (Gavel, 2008). **Military powers use HADR operations abroad as opportunities to deploy military resources to serve objectives that are not only diplomatic, but also military power.**

HADR operations abroad in response to disasters are at the centre of a multitude of **cooperative military exercises**. In June 2022, the French Armed Forces in the Caribbean (FAA) conducted an international aeromarine exercise on the eve of the hurricane season entitled "CARIBBEAN 2022" with partner forces in the area: the United States, the Netherlands, England and the Dominican Republic (ministère des Armées, 2022). Similarly, numerous exercises take place in the Pacific, such as CROIX DU SUD 2023, organised by the French Armed Forces in New Caledonia (FANC) with the last session taking place in May 2023 with 20 partner countries from the Pacific area (ministère des Armées, 2023). Interestingly, joint population relief exercises are the last area in which the US still agrees to cooperate with China, as demonstrated in March 2023 by the participation of Chinese forces in the Cobra Gold multilateral exercises (Pina, 2024).

Regional multilateral associations are also essential links in the disaster management chain. ASEAN (Association of Southeast Asian Nations) organised more than 20 exercises of this type between 2005 and 2019 (Cabasset, 2020). **The participation of armed forces in joint military exercises is a strategic lever for maintaining solid relations with allies or creating new partnerships.** These exercises are also an opportunity for forces to learn and develop know-how through contact with other armies, and to train in real conditions. China, for example, is stepping up its cooperation and military exercises in disaster relief, not only for the purposes of military diplomacy, but also to gain operational experience (Pina, 2024).

Like exercises, **HADR operations abroad in response to disasters are essential strategic opportunities for maintaining operational skills, particularly in peacetime.** Deploying forces abroad to assist a State allows forces to be tested and their capability gaps to be identified. If the intervention of the forces is successful, it allows them to highlight **their military capabilities**: availability of forces and speed of intervention, resilience of equipment and personnel, etc. **The effectiveness of an HADR operation is**

a good indicator of the operational readiness of conventional security forces and conveys a positive image of a State's armed forces. For example, **China** mobilises major military transport resources to help disaster victims, including the hospital ship Peace Ark, a military vessel with 300 beds and 8 operating theatres, which was deployed in 2013 as part of an emergency response in the Philippines following Typhoon Haiyan³⁹, and the Y-20 cargo plane which regularly delivers relief supplies during Chinese IESU operations (Pina, 2024)⁴⁰. **Russia** has also deployed military resources to Vanuatu, Bolivia and Mozambique, States far from its territory, demonstrating its ability to move quickly. Similarly, the US-led HADR operations in the Pacific are a signal to China that the US army can deploy rapidly and massively in the region if necessary.

HADR operations abroad in the context of climate disasters are a real opportunity for military projection and the extension of power. For example, they are an essential vehicle for China's military presence in the Pacific, where Beijing is seeking to cut off US access to strategic areas, and on the African continent: China partly justified the opening of its base in Djibouti by its desire to provide humanitarian assistance (Pina, 2024). This also demonstrates **the use by certain powers of HADR operations abroad as a means of justifying the acquisition of new defence capabilities.** Another example can be found in Australia's acquisition of HMAS Canberra, which was justified based on population relief needs, and whose maiden voyage was an HADR operation abroad to Fiji after Cyclone Winston in 2016 (Stevenson & Envall, 2019).

The increase in the frequency and intensity of natural disasters caused by climate change opens up a new challenge for military power, insofar as a State capable of managing the consequences of a climate disaster on its own territory, but also abroad by deploying its forces, appears on the international stage as a powerful, reliable, responsive and effective partner, while deploying justified and legitimate military power. **This operational superiority is coupled with a strategic advantage: the ability to deploy its forces on the territory of other States in a justified manner. In this way, HADR operations abroad highlight the real geostrategic vulnerability that climate insecurity can represent on national territory.**

³⁹ The Chinese hospital ship Peace Ark is regularly deployed on long-term humanitarian medical missions. The most recent mission took place in 2023 in the Pacific islands of Kiribati, Tonga, Vanuatu, Solomon Islands and East Timor (Natuzzi, 2023). However, these missions have been excluded from our analysis, as they do not fall within the scope of HADR operations abroad.

⁴⁰ More recently, and in the context of a natural disaster of non-climatic origin, Chinese military forces came to the aid of Papua New Guinea following the violent earthquake in the spring of 2024. A ceremony of thanks was held in the presence of Papua New Guinea's Defence Minister, Billy Joseph (PNG Today, 2024, 25 avril).

B – Climate vulnerability and military inferiority

States that are both vulnerable to climate change and limited in their disaster response resources are forced to accept the presence of foreign military assets. They may therefore be exposed to the risk of foreign armies establishing themselves on their own territory, and to the influence of extra-regional powers (Grare & Levallant, 2023). **This trend, exacerbated by climate change, is an opportunity for military powers to project themselves militarily and politically into coveted regions.** In such cases, a foreign military presence can be seen as reassuring: the Manila Ambassador to Washington said that the US intervention in the Philippines in 2014, after the powerful typhoon Haiyan, had convinced people of the benefits of having US troops and equipment pre-positioned in the event of a disaster (Capie, 2015). Conversely, in other cases, the State receiving aid may perceive the risks of an EFSA on its own territory. In 2018, Indonesia was hit by an earthquake and tsunami, but refused the deployment of the Chinese army on its territory⁴¹ (Levallant, 2024).

The occurrence of increasingly frequent and intense climate disasters could, however, put some States in a situation of capacity breakdown, and **force them to accept foreign aid, whether desired or not.** During the Covid-19 pandemic, for example, the Chinese army delivered doses of vaccines and medical equipment to regions that traditionally rely on US support, such as Latin America and Europe⁴². The medical aid provided by China has often been conditional on various favours being granted to the regime, such as public demonstrations of gratitude by officials in recipient countries, or the governments of recipient countries taking a stance in favour of Chinese positions on certain issues. Hungary, for example, blocked EU statements criticising China in April 2021, just a few weeks after the purchase of millions of doses of Chinese vaccines. The supply of vaccines has in some cases enabled Beijing to achieve its foreign policy objectives, meaning that several States have had to accept Chinese conditions in return for medical aid, whether they liked it or not (Lin et al., 2021).

During certain recent climate disasters, Western countries have also had to call on other countries, allies or not, to support them. In 2023, France deployed mixed forest fire detachments (ForMiSC) made up of civil firefighters and rescue services to support Canada, which was unable to contain the disaster on its territory despite having considerable resources and expertise in this area. Similarly, in 2022, France had to ask for European assistance in the face of the violent forest fires affecting the country, and obtained operational assistance from Greece, Romania, Austria and Italy. Although France obtained help from allied powers, **it is possible that in the future, in a context of acute climate**

⁴¹ While many countries deployed their own military resources to help Indonesia in the wake of the natural disaster, China was not one of them, probably because of Jakarta's reluctance to see the Chinese army deployed on its territory (Gong and Jayaram, 2023).

⁴² The Chinese army has delivered doses to Bolivia, Ecuador, Peru, Venezuela and Argentina, as well as to Japan, Morocco, Saudi Arabia, Hungary and Ukraine (Garnier, 2021).

insecurity, authorities will ask for help from States that are less close, if traditional partners are not available.

III - FORESIGHT AND RECOMMENDATIONS

Scenario 1: 2046 - Loss of influence in the Mediterranean

This scenario looks at the role played by HADR operations abroad in promoting France's influence on the international diplomatic stage. The story highlights the geostrategic issues at stake in the race for emergency aid between major powers in the Mediterranean, through interventions mobilised as a tool of influence and a demonstration of military power.

In 2046, Egypt and its Mediterranean neighbours experience intense warming, with maximum temperatures reaching 55°C, in line with the IPCC's *business-as-usual* RCP8.5 scenario. Rising sea levels affect Mediterranean coastal areas such as the port of Beirut, the Nile delta, the Tunisian coast from Tunis to Cap Tarf, the Aegean coast north of Izmir, the Italian Venetian coastline and the coastal area of Algiers. Reduced rainfall also leads to **the drying up of land** and a **drastic drop in groundwater levels**, as well as **an extreme water shortage**. Some Egyptian towns become uninhabitable, particularly on the banks of the Nile, which face increasing economic and migratory pressures on a non-very resilient government. The **water and food security of the Egyptian population deteriorates**, especially due to the salinisation of arable land and the gradual drying up of the Nile, linked on the one hand to climate change and on the other to the construction of new dams upstream on the Nile in Ethiopia and Sudan. **Alexandria, Egypt's coastal city of several million inhabitants, gradually sinks by around 4.5 millimetres a year, a phenomenon which started in the 2020s**. Many coastal areas of Alexandria are irreversibly submerged, despite the construction of concrete dykes to protect houses. In addition, demographic pressure in the poorest parts of the city are exacerbated by the influx of people from the submerged areas - in particular Egyptian farmers from the Nile delta, and people from the coastal areas who are gradually moving inland. These densely populated residential areas see the emergence of insalubrious and even precarious buildings, which are extremely vulnerable to climatic hazards and are regularly flooded.

In autumn 2046, very heavy rainfall hits the Nile delta, from Alexandria to Port Said, causing **unprecedented flooding, exacerbated by rising sea levels**. The poor and overcrowded districts of Alexandria are devastated, particularly in the east of the city where several buildings collapse. **The provisional death toll stands at several hundred, but the Egyptian Red Crescent expects it to rise to several thousand. The Egyptian government quickly see its relief capacities saturated and ask for international aid**. As autumn ended, France is already dealing with floods that are ravaging the north of the country, as are Belgium, the Netherlands and Germany, which are unable to organise emergency military relief operations in Egypt. **Motivated by its energy dependence on Egypt, France nevertheless decides to provide humanitarian aid to Alexandria, as well as a search and rescue team**. Based in Jordan, the French armies have regularly intervened in the Jordan basin since the 2030s, in a context

of rising tensions between the Palestinian, Israeli, Jordanian, Lebanese and Syrian populations due to the gradual drying up of the river. Through this emergency relief operation in Egypt, France affirms its support for a key partner and reiterates its commitment to Mediterranean countries. Finally, against a backdrop of tense diplomatic relations over the last few months, Egypt refuses US aid.

In Alexandria, the major problem is **the flooding of the harbour, which prevents the French military ships delivering aid from docking**. The Chinese army, which has anticipated this obstacle and has a reinforced presence in Djibouti, quickly arrives in Alexandria. It deploys **an artificial causeway** in the south-east of Alexandria, stretching over long distances and supporting a considerable amount of weight. This enables ships to quickly unload their cargoes on land if there is no port or dock to moor them. Russia, India, Saudi Arabia and the United Arab Emirates, which also provide humanitarian military aid to Egypt, ask China for permission to moor their ships at its causeway. Faced with these numerous requests, China deploys a second one, enabling the various armies to transport their humanitarian convoys and military and civilian personnel on land. **China thus assumes the role of humanitarian aid coordinator**, organising search and rescue operations, as well as the distribution of material humanitarian aid. Having to dispatch not only French aid, but also European aid, **the French armed forces find themselves compelled to ask China for assistance in using its causeway**. This constraint also takes the form of a **diplomatic imperative**, as the Egyptian government has already publicly thanked France for its support.

In the context of tense relations between the European Union and China, **France's operational dependence on China puts it at odds with its partners**. France's capability failure is even more stinging given that the Chinese government organises a press conference, announcing that it has helped France, and saying that it is looking forward to a "new era of Sino-French cooperation". Asking for Chinese operational aid also demonstrates a **lack of anticipation and preparation on the part of French armed forces for a disaster-stricken theatre of operations**, and a **lack of innovation in terms of adapting infrastructures to climate change**. China has demonstrated its military, operational and technological superiority in this intervention, contributing to the development of its influence in the region. In addition to this diplomatic and strategic setback, the operation also raises security issues. It is risky for the French ship to be so close to a Chinese vessel, as the Chinese army has significantly developed its cyber-defence and cyber-espionage capabilities, as well as its listening and intelligence systems, raising the **risk of a potential leak of French military data**. China could use this geographical proximity to obtain information on French military technologies, or on strategic positions and infrastructures in the region.

Scenario 2: 2050 - Humanitarian crisis in the South Pacific

This scenario was based on discussions with armed forces personnel in French Polynesia and exposes the capacity limits of the French armed forces overseas. The narrative highlights the inadequacy of the pre-positioned forces in French Polynesia in face of a major climatic disaster and their lack of military means.

In 2050, the average regional temperature in the South Pacific is 2.6°C higher than the pre-industrial average. Regional sea level rise reaches 33 centimetres compared to 2024 but increases exponentially as West Antarctica passed the climate tipping point⁴³ of ice melt seven years earlier. **The 118 Polynesian islands, spread over 2.5 million km⁴⁴, are in the grip of a gradual submersion** phenomenon. Mostly located on the island of Tahiti, eight out of ten inhabitants live less than a kilometre away from the sea, and the number of buildings on the coast has increased eightfold since 1981. The increasing uninhabitability of certain archipelagos - such as the Tuamotu Islands, which are 18% submerged - and particularly their coastlines, **exacerbates demographic and urban pressure inland** and on neighbouring islands. **The decrease in cyclonic activity in the region due to climate change, triggers a lack of culture of climate risk latent in Polynesian society.** However, this decrease in frequency is coupled with an **increase in the intensity**, which is pushing the Armed Forces in French Polynesia (FAPF) to regularly train for cyclone exercises.

On April 26, 2050, a storm warning is issued by *Météo-France*. A cyclone forms to the west of the Polynesian islands. On the **evening of April 28, a tropical cyclone with winds exceeding 225km/h, and causing waves of eight metres high hits the Society Islands, including Tahiti. The cyclone strengthened on Tuamotu and headed southwards, between the Gambier and Austral islands,** which were completely devoid of means of relief for the population. In the eye of the storm, French armed forces take advantage of the re-establishment of the satellite network to announce **the destruction of the port of Papeete and the Taaone hospital.** The day after the passage of the category 5 cyclone, winds are still over 100 km/h, preventing drones from flying over affected areas. **Faa'a and Hao, the only airstrips available in French Polynesia, are submerged for the first and awaiting clearance for the latter.** Torrential rains destroy crops, food stocks and newly built houses in the valleys. Against this backdrop, pre-positioned forces are quickly overwhelmed.

⁴³ See definition in the glossary.

⁴⁴ See definition in the glossary.

Four light military helicopters are mobilised to evacuate the 2,500 inhabitants of Rangiroa atoll to New Caledonia or Bora Bora. The other islands, in particular the Austral Islands and the Gambier Islands, **have to wait for help from mainland France**. However, **almost all the military units from mainland France are unavailable, having been mobilised for floods**. Only 10 medical reinforcements arrive by air within 48 hours, and France sends its BSAOM from New Caledonia 9 days later. The ships from mainland France arrive within three to four weeks with logistical support and heavy amphibious resources. As French forces are unable to meet the evacuation requirements, **the United States are asked to help**, but due to the impassability of Faa'a, they are only able to send tactical reinforcements to Bora Bora. **India** provides the most rapid assistance: **four transport helicopters are deployed to carry out urgent medical evacuations**. Japan, for its part, deploys 30 soldiers and relief supplies on board a navy vessel that reaches Tahiti in 13 days. **Against a backdrop of deteriorating relations within the FRANZ alliance, France cannot count on its allies**, who are also battling forest fires on their territory. After three days, **the available water resources in the five archipelagos fall short of demand**. Groundwater is salinized, and freshwater reserves in coastal areas is contaminated by hydrocarbons circulating in surface waters. The freshwater resources inland are also infected by microscopic parasites transmitted by flooding, leading to the spread of a cholera epidemic. The armed forces have only two water desalinisers, preventing efficient redistribution to the Polynesian islands, while the stock of drinking water reaches critical levels. It is up to the High Commissioner of the Republic in Polynesia to decide on the distribution of water resources: **90% of the drinking water stock remains in Tahiti, where there is the greatest concentration of population**. The FAPF also encounter difficulties in transporting supplies from Tahiti to isolated communities, since port infrastructures and civilian ships have been damaged by the cyclone. **Riots break out, fuelled by the population's dissatisfaction with mainland France**. This civil unrest puts additional pressure on military forces mobilised to maintain order and protect critical infrastructure⁴⁵.

French armed forces thus find themselves in a **situation of capability breakdown**. Transport capabilities, particularly air transport, are stretched to the limit at the time of the cyclone, **making France dependent on India for its capabilities**. The BSAOMs (overseas support and assistance buildings) enable many Polynesians to be evacuated, but the most remote islands (more than 1,300 kilometres away) could not be reached in time. In addition, the BSAOM's flat-bottomed craft⁴⁶ meant that engineering vehicles cannot be put ashore to open the roads. In addition, one of the two aluminium boats is unavailable following contact with coral. This shortcoming rekindles the need for a new-generation BATRAL, which has not been funded despite being mentioned in the 2024/2030 military programming law. The vulnerability of critical infrastructure, in particular airstrips and the

⁴⁵ See definition in the glossary.

⁴⁶ One based in Tahiti, the other in Noumea.

hospital, **highlights shortcomings in strategic thinking about their location in high-risk areas, and in maintenance.** In humanitarian terms, **France records 2,182 dead and more than 20,000 injured in a two-week period.** **The lack of training in evacuation and first aid procedures and in the risk of hurricanes exacerbated the humanitarian toll, particularly on the most isolated islands.** The discontent of the Polynesian population is struggling to subside, **pointing to the lack of local capacity to desalinate seawater, and the absence of national reserves of drinking water and first aid resources.** The Polynesian population also denounces the preferential treatment given to Tahiti and, more generally, the monopolisation of resources by metropolitan France. **This intervention affects not only France's political legitimacy in Polynesia, but also its influence in the Indo-Pacific and its role as a provider of humanitarian aid on the world stage.**

Scenario 3: 2045 - Operational dilemma in the metropolitan area

This scenario looks at the risk of saturation of French armed forces' capability means, in a context of multiple demands - metropolitan France, overseas territories and external demands. The possibility of a capability breakdown in the event of climate disasters entails a risk of interference by foreign powers, who would be called upon by France to support armed forces.

In 2045, the northern hemisphere faces a proliferation of terrorism, fuelled in part by the destabilisation and shocks produced by climate change on an international scale. Climate change has exacerbated socio-economic inequalities and tensions over access to natural resources, particularly water and arable land. Climate change has also exacerbated socio-environmental conflicts over land-use planning and resource extraction projects, crystallising divisive representations of the relationship between human societies and their environment. The increase in the number of climatic hazards has also led to a significant drop in transnational human movements, as affected populations no longer have the necessary resources to leave their territories. However, a few exceptional cases, such as the displacement of people from Central America to North America, provide **fertile ground for the emergence and spread of nationalist ideologies** in the United States and Europe. In the United States, nationalism has taken the form of a **policy of radical isolationism**, with the country withdrawing completely from global affairs, including international climate governance, to protect its national interests. In this context, two ideological phenomena developed simultaneously: on the one hand, **the rise of nationalism in the northern hemisphere**, with European and American politicians raising the spectre of the "migratory wave", i.e. an increase in migratory flows from the most vulnerable countries. On the other hand, **the exacerbation of anti-Westernism in the southern hemisphere,**

fuelled by the growing uninhabitability of several territories, blames on countries historically responsible for climate change.

This anti-Western sentiment, exacerbated by the nationalism of the countries of the North and by the withdrawal of the United States, leads to **a rise in non-state armed groups and an upsurge in terrorist acts on European and American soil**. In France, since the beginning of the 2040s, nearly thirty attacks have struck major cities every year, prompting the government to mobilise **15,000 soldiers to defend the country as part of Sentinelle 2**. France also must contend with a significant deterioration in weather conditions, not only in its overseas territories but also in mainland France. At the start of 2045, France faces **devastating heatwaves and droughts across almost the entire country**. From the beginning of February, more than fifteen departments are on drought alert. In the Gard and Alpes-Maritimes departments, annual rainfall has fallen by almost 40% compared with 2000-2020 averages, while summer temperatures have risen significantly, regularly exceeding 40°C. In the Vaucluse region, groundwater reserves are being depleted at an alarming rate, with rivers such as the Sorgue and the Ouvèze experiencing a reduction in flow of almost 80%. Finally, these droughts cause major economic losses, for example in the Hérault region where vineyards, the backbone of the local economy, see their yields halved compared with 2020.

Starting in May 2045, a series of megafires spread across a very large part of mainland France. Provence-Alpes-Côte d'Azur, Occitanie and Nouvelle-Aquitaine are the first to be affected, but Auvergne-Rhône-Alpes, Centre-Val de Loire, Pays de la Loire, Bretagne and Île-de-France soon follow. In two weeks, **almost 70,000 hectares of forest vanish, and several thousand people must be relocated**. By the end of May, civil protection forces, supported by armed forces, who are mobilised as part of Operation Héphaïstos, find themselves completely overwhelmed. At the same time, **a category 3 hurricane hits the Antilles, and armed forces are dispatched to bring relief to French overseas territories in the region, which limits the air support available to armed forces in mainland France**. Human means also lack, but additional mobilisation of armed forces stationed in mainland France requires some of the personnel deployed on Sentinelle 2 to be reassigned. Against a backdrop of heightened terrorist risk, the Ministry of the Armed Forces and the Ministry of the Interior decide, by mutual agreement, not to reassign Sentinelle 2 forces and **to call on the European civil protection mechanism**. However, the airborne resources of the European reserve are already mobilised to fight wildfires in Greece and Spain, and most of the European countries that have developed resources and expertise in fighting forest fires, chief among them Portugal, Italy, Spain, Greece and Romania, see their resources saturated. The only countries to respond are **Hungary, Bulgaria and Slovakia, which send 300 fire-fighters, 12 land vehicles, four Canadairs and three helicopters**. With their support, tens

of thousands of people are evacuated throughout mainland France, with special efforts in Corsica, where 12,000 people are evacuated by air and sea.

In the space of two months, **France deplores the loss of more than 200,000 hectares of forest in almost all the departments of mainland France, and 280 victims, including 17 civil protection personnel.** Furthermore, although French armed forces manage to put out the fires in mainland France with the support of Hungary, Bulgaria and Slovakia, **the sympathy of these countries towards Russia and the close economic and energy links they have forged with the latter raise questions about France's strategic autonomy.** Doesn't its dependence on military aid from countries that are admittedly members of the European Union, but with opposing geopolitical leanings, call into question **its ability to defend its national interests without being influenced by foreign powers?** This is the concern of France's traditional partners, particularly Germany, which sees France's vulnerability to climate change as a strategic risk factor. This event could **strengthen Russia's political and diplomatic influence in Europe, putting France at odds with the European Union's efforts to counter its expansionism.** On a more operational level, the presence of foreign military personnel on French territory could also **increase the risk of leaks of sensitive information about French military capabilities and strategic infrastructures.**

Recommendations

1

Anticipate the increase in requests to armed forces for HADR operations in response to climate disasters by civil protection units

- Set up a tool to record HADR operations conducted by French armed forces at all territorial levels to ensure that information is fed back to the Centre for Planning and Execution of Operations (CPCO), and to consolidate data on the evolution of the forces' involvement in this area.
- Integrate a strategic reflection within the Ministry of Armed Forces on the evolution of core activities of armed forces and the role they should play in HADR operations in response to climate-related disasters.

2

Ensure the redundancy of the most critical military capabilities on national territory to guarantee greater autonomy for overseas territories

- *Human resources:*
 - Strengthen the numbers and capacities of the Adapted military service (SMA) overseas, where demography allows it.
- *Material resources:*
 - Reinforce and specialise the resources of the 4 civil protection training and intervention units (UIISC) according to localised climate risks.
 - Reinforce obsolete air capabilities while ensuring operational continuity, and ensure air capacity (A400M, CASA, manoeuvring helicopters) overseas.
 - Strengthening the amphibious capacity of overseas France (BATRAL).
 - Set up national reserves for storing first aid products in areas with low climatic and security risks.

E.g. Increase support means (chainsaws, electric generators, tents, beds), food stocks (drinking water reserves, non-perishable foodstuffs, water purification tablets) and medical equipment (defibrillators, inhalation equipment, rehydration solutions, antibiotics).

3

Strengthen international cooperation in the scope of HADR operations abroad

- Establish cooperation protocols for the Atlantic zone between the United States, Canada and the European Emergency Response Coordination Centre (ERCC), to facilitate the coordination of response forces, such as FRANZ.
- Stand as a driving force in the implementation or optimisation of a European mechanism for sharing information and know-how from each Member State on the management of climate-related disasters.

4

Strengthen the resilience of rights of way, national reserves and transport routes, particularly in overseas France

- Continue efforts to map the climate vulnerability of military bases and critical infrastructures (ports, hospitals, airports, coastal roads, etc.).
- Establish relocation projects for military sites located in high-risk climate zones.

5

Contribute to the development of a risk culture within the French population, adapted to the climate risks of each territory

- Train all military personnel in climate risks and its management.

E.g.: set up local climate risk training on each military base for all military personnel attached to the base.

- Use armed forces to contribute to the training of the civil society in risk culture.

E.g. setting up climate crisis exercises and emergency first aid training for the public, in partnership with the civil protection authorities.



GLOSSARY

Amphibious capabilities/means: capabilities and equipment used by armed forces to conduct operations in maritime and land environments, combining naval and land capabilities. Amphibious operations involve the movement of military forces from sea to land or vice versa, and can include landings, coastal assaults, evacuations, reconnaissance and other tactical or strategic missions.

Beach operation: landing of troops, vehicles and equipment from ships on a beach or coastal area, often as part of an amphibious mission.

Capability gap: situation where the available operational capabilities are insufficient to meet the needs or requirements of a mission.

Climate change: variations in the state of the climate observed since the end of the 20th century, attributed directly or indirectly to human activity, modifying the atmosphere composition. These variations result in the occurrence of specific, slow-onset hazards that can have environmental implications, as well as safety implications.

Climate insecurity: all risks and vulnerabilities linked to the impacts of climate change on individuals, communities, ecosystems and infrastructures, including extreme weather events, food security, public health, population displacement and economic and ecological disruption.

Climate tipping points: critical thresholds in the climate system (such as the melting of the Greenland ice sheet or the dieback of the Amazon rainforest). Overpassing these tipping points can have irreversible and significant effects on the environment and the global climate.

(Climate) Vulnerability: propensity or predisposition to be adversely affected by climate change (slow variability and rapid extreme events). It depends on the sensitivity of the natural environment, the fragility of the human environment and adaptation policies.

Critical infrastructure: systems and facilities essential to national security, public health, economic stability and the general well-being of the population (energy, water, transport and communications networks). They must be adapted to climate change to ensure that society continues to function properly.

Demographic pressure: the impact of population growth on natural resources and the environment, exacerbating challenges of climate change such as deforestation, pollution and demand for water and energy.

Humanitarian assistance and disaster relief (HADR) operations: actions undertaken to provide humanitarian aid and relief during disasters or emergencies. When these actions are carried out to assist the population of another State, they are referred to as **HADR operations abroad**.

Hydric stress: phenomenon of strong tension on water resources of an area, occurring when the demand for water exceeds the quantity of water available, or when its poor-quality limits its use. This expression is also used to describe the biological phenomenon whereby the quantity of water transpired by a plant is greater than the quantity of water absorbed.

"Megafire": despite the absence of a unanimous scientific definition, a "megafire" can be defined based on several criteria: the speed of propagation, the intensity of propagation, the area, when it occurs in unusual environments, the exceptional damage and surface area (the surface area being relative to each country). These "megafires" are likely to multiply because of climate change.

Military engineering: all the construction, fortification and destruction techniques and operations used by armed forces to support military operations. This function must enable or facilitate the mobility of armed forces and hinder the mobility of enemy forces.

Natural disaster: extreme natural event causing considerable damage to people, infrastructure and the environment. In the case of storms, floods, droughts and heatwaves, these are referred to as **extreme weather events** or **climate-related natural disasters**, because their frequency and intensity may be affected by climate change.

Reputational gains: the political, diplomatic and economic advantages and benefits that a country can gain from an effective, rapid and well-coordinated response to humanitarian crises and extreme weather events.

Risk culture: refers to the place occupied by risk, in this case climate risk, in the mental and collective representations of a population. It encompasses knowledge of the major risks in an area and the transmission of this knowledge so that all stakeholders can anticipate and prepare for disasters.

Sea flooding: inundation of coastal areas caused by rising sea levels and extreme weather events, resulting in loss of land, damage to infrastructure and impacts on coastal ecosystems.

Soft power: a State's ability to influence and attract other international players (countries, international organisations, populations) without resorting to force or coercion. The concept is based on three pillars: culture, values and political ideals, and foreign policies such as development aid, cultural diplomacy and intervention in the event of natural disasters.

Strategic autonomy: the ability of a State to define and pursue its own national, economic and political security interests and objectives independently, without excessive dependence on other countries or groups of countries.

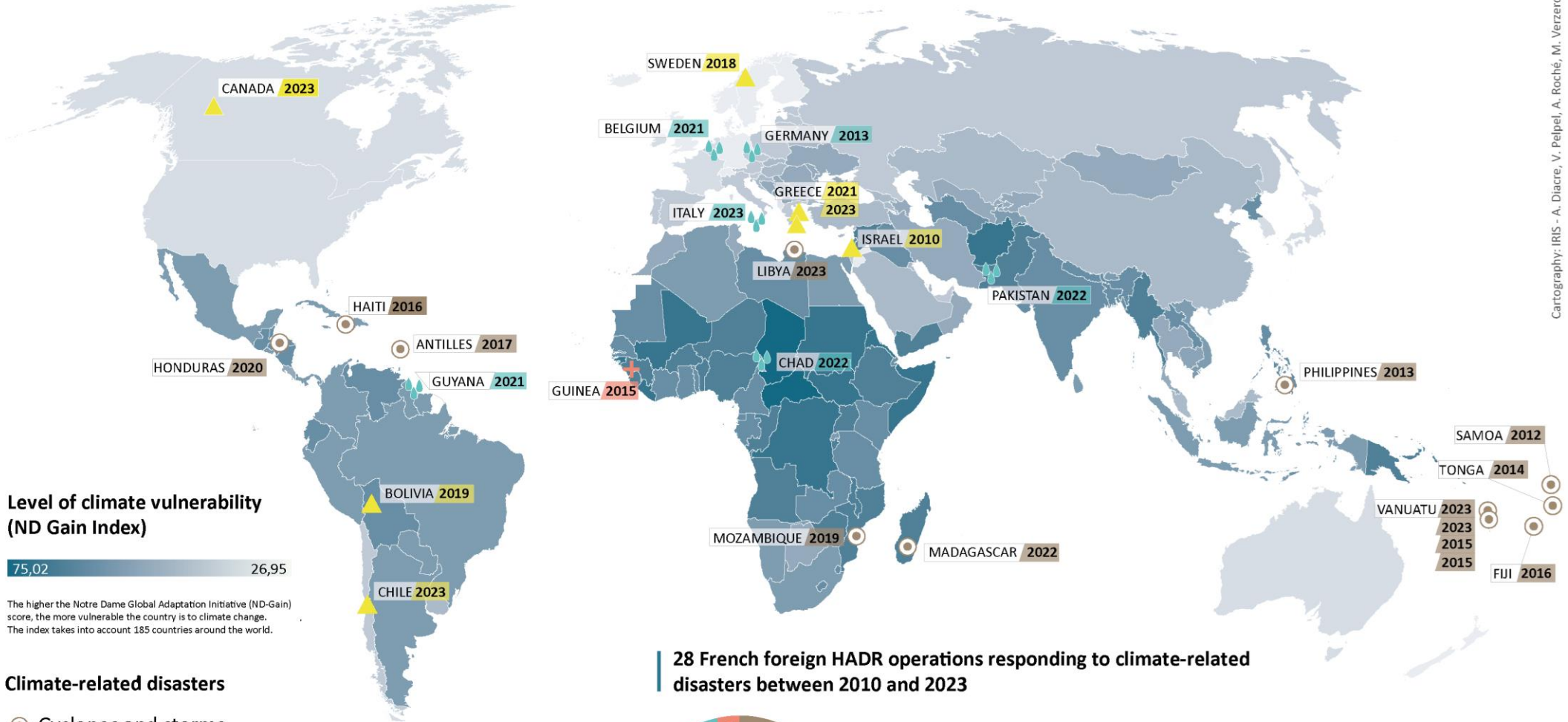
Water security: the capacity of a population to guarantee sustainable access to a sufficient quantity and quality of water, at an affordable price, to maintain human health, livelihoods and well-being, while preserving the ecosystems that provide these resources.

APPENDICES

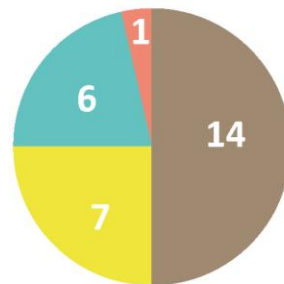
Appendix 1. Map: France's foreign HADR operations in response to climate-related disasters (2010-2023)¹



Cartography: IRIS - A. Diacre, V. Pélipet, A. Roché, M. Verzeroli



28 French foreign HADR operations responding to climate-related disasters between 2010 and 2023



- Cyclones and storms
- ✚ Epidemics
- ▲ Forest fires
- 💧 Extreme precipitation and flooding

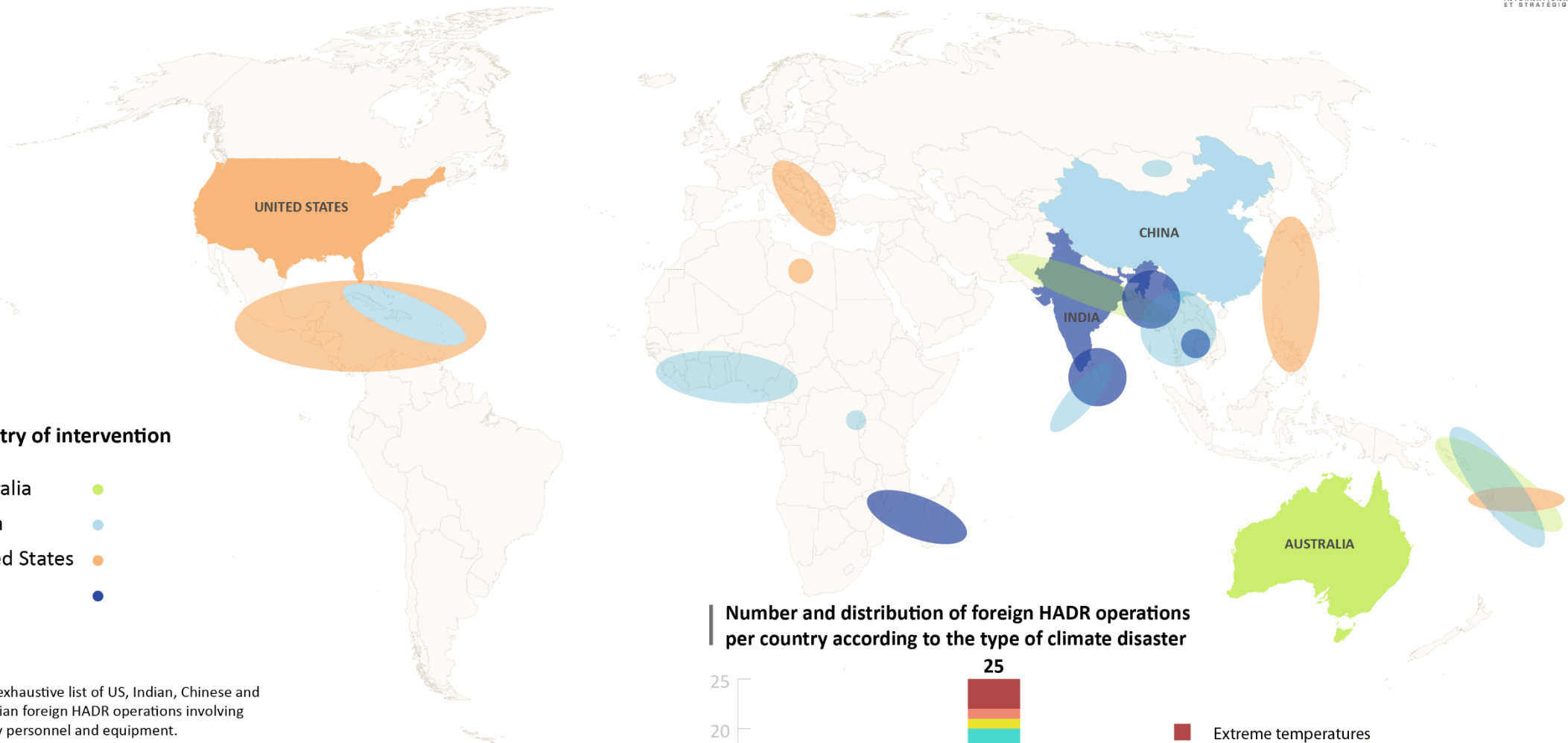
¹ Non-exhaustive list of French foreign HADR operations that have mobilised military human and material resources within a bilateral or multilateral framework, for example as part of the FRANZ agreement. This includes the mobilisation of military civil protection units.

Sources: CdCS (French MEFA) ; Deutsche Welle, 2018 ; FranceTVInfo, 2016 ; High Commission of the French Republic in New Caledonia, 2015 ; IHEDN, 2021 ; Laurent, 2019 ; New Zealand Ministry of Foreign Affairs and Trade, 2014 ; Ouest France, 2017 ; Reliefweb ; French Ministry of Defence website ; French Ministry of Europe and Foreign Affairs website ; French Ministry of the Interior and Overseas France website ; Civil Security Training and Intervention Unit 1 website ; Civil Security Training and Intervention Unit 7 website

Appendix 2. Map: Main projection areas for Australia, China, the USA and India for foreign HADR operations in response to climate-related disasters (2010-2023)¹



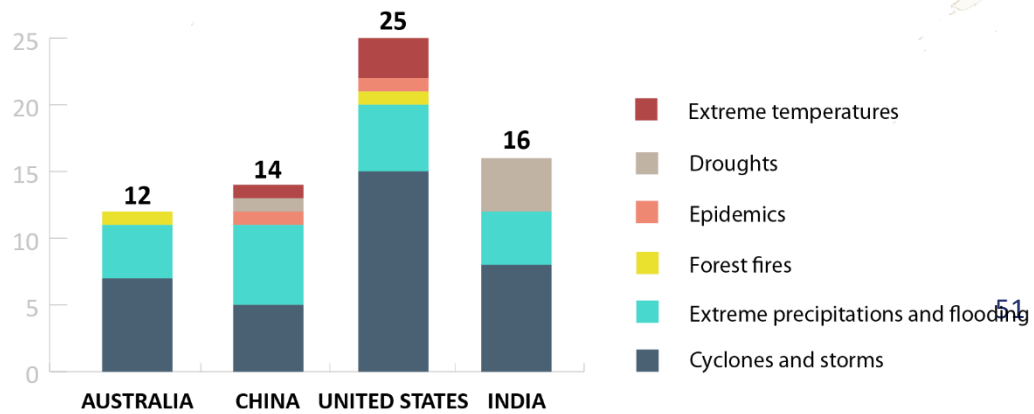
Cartography: IRIS - A. Diacre, V. Peipel, A. Roché, M. Verzeroli



Country of intervention

- Australia ●
- China ●
- United States ●
- India ●

Number and distribution of foreign HADR operations per country according to the type of climate disaster



¹ Non-exhaustive list of US, Indian, Chinese and Australian foreign HADR operations involving military personnel and equipment.

Sources : Australian Defense website ; Australian Ministry of Foreign Affairs website ; Asia & Pacific, 2013 ; Chakradeo, 2020 ; China Daily, 2017 ; China International Development and Cooperation Agency website ; China Military website ; Council on Strategic Risks, 2024 ; Deccan Herald, 2020 ; Gurjar, 2020 ; Indian Ministry of External Affairs, 2020 ; Layton, 2021 ; Moyer et al., 2021 ; Newby, 2020 ; Nouwens, 2021 ; Ouest France, 2017 ; Pakistan Today, 2022 ; PIB Delhi, 2023 ; Relief Web, 2018 ; Sciences et Avenir, 2015 ; ShareAmerica, 2019 ; Schanbog et al., 2022 ; The Indian Express, 2021 ; The Print, 2023 ; United States Army website ; United States National Guard website ; United States Navy website ; Westphanlen, 2016.

Appendix 3: Summary of recommendations of the IHEDN article and the note by the Future Conflicts Observatory (FRS/IFRI)

Recommendations from the article: Contributions and cooperation of military forces in response to climate-related disasters: transatlantic perspectives by the Institute for Advanced Studies in National Defence (IHEDN) in 2021.

General organisation:

- Create an agency responsible for natural disasters to bring together expertise in prevention and crisis management of natural origin.
- **Create a reserve civilian security force with military status, modelled on the US National Guard.**
- Create a communal citizens' reserve made up of French citizens who have reached the age of majority and are fit to serve for 5 years at the end of the universal national service.
- **Set up a skills database for civil protection force personnel.**
- Include armed forces intervention in the management of natural disasters in the strategic "protection" function.
- Define an exceptional legal framework allowing exceptions to the normal rules to facilitate and speed up crisis management and post-disaster reconstruction operations.

Strengthening the resilience of populations and infrastructures:

- Create a shelter for people who cannot be evacuated and make these reinforced shelters systematically available (in new collective or individual buildings).
- **Provide vital services with enhanced infrastructures to ensure their availability immediately after a crisis.**
- **Ensure redundancy of the most critical capacities to guarantee a minimum service.**
- Certify essential and vital services according to specific local climate risks.
- Set up a regional skills database listing the specific skills and specialists available in the event of a crisis.
- **Ensure the resilience of airfields to enable rapid delivery of emergency aid.**
- Regularly test the resilience systems to ensure they are working properly.
- Create and distribute a mobile phone application that uses geolocation to send the location of shelters.

Populations:

- **Generalise prevention training according to risks in each zone.**
- Train secondary school students in safety, intervention and emergency procedures.
- Include a comprehensive disaster response module in the Universal national service.
- **Set up a neighbourhood network (through the municipal reserve) to disseminate prevention, communication and training initiatives by the civil protection force.**
- Organise twice-yearly training sessions by neighbourhood to develop individual and collective resilience.

Development of intervention capabilities:

- **Define support for the management of natural disasters as a priority mission for sovereignty forces in French overseas departments and territories.**

- Describe dual capabilities in the military programming law.
- Use European financial aid to benefit dual military disaster response resources.
- **Strengthen mobility and projection capabilities in the Antilles, given the size of the area.** Future deliveries of A400Ms should make up for the shortfall in strategic transport, but there will still be a shortfall in manoeuvring helicopters and BATRAL-type ships.
- **Increase the size of Adapted military service (SMA) regiments in overseas France.**
- **Reinforce existing civil security response units or create an additional unit deployable with heavy air-transportable resources.**
- Bring the personnel and fleet of fire-fighting aircraft under military status.
- Ensure the air transportability of civil security resources (A400M).

International and transatlantic cooperation:

- **Establish cooperation protocols for the Atlantic zone between the United States, Canada and the ERCC to facilitate the generation of intervention forces.**
- **Strengthen the ERCC by encouraging more EU countries to participate.**
- Give the ERCC the power to manage dual military assets.
- **Create a global network of military leaders to define a crisis management model.**
- **Ensure the interoperability of resources between France, the United Kingdom, the Netherlands and the United States.**
- Schedule international emergency exercises.

*Recommendations taken from the note **La contribution des armées aux interventions de secours d'urgence en catastrophes naturelles de grande ampleur (The contribution of the armed forces to emergency response to large-scale natural disasters)**, produced in 2021 by the Observatoire des Conflits Futures (Foundation for Strategic Research (FRS)/French Institute of International Relations (IFRI)).*

Adapt armed forces' contribution policy:

- Provide more meaningful support for the armed forces' contributions:
- **Strengthen the operational integration of the armed forces with civil protection capabilities**, by making the armed forces more proactive in planning and preparing emergency response.
- **Reinforce the priority given to the acquisition of "dual" capabilities**, to counter the increased pressure on the limited availability of military capabilities for their main missions.
- **Develop the missions and skills of armed forces to give them direct responsibility for these operations**, in coordination with the Ministry of Interior agencies.
- Develop devolved capacities by expanding dual capacities (transport and support) and/or by developing specific dedicated capacities to complement them.

Capacity adaptations:

Optimising capacity within the framework of existing policy:

- **Improve the resilience of armed forces' capabilities in the face of climate phenomena:**
 - o Resilience to extreme heat (particularly for equipment),
 - o Adapt rights of way located in major risk zones, particularly those of the presence and sovereignty system.

- **Strengthen cognitive interoperability** with civilian organisations (communication efforts), for example in armed forces information systems with the Ministry of the Interior's National institute of posts and telecommunications, in the doctrinal field, and in the political field: for example, by proposing to our partners in the Caribbean and Indian Ocean that they enter into cooperation agreements like FRANZ.

Optimising support for the armed forces' contributions:

- **Optimise the integration of the armed forces' contribution to emergency relief operations**, by contributing to the civil authorities' crisis management plans, clarifying "4i" capability levels, adapting the operational preparation of the armed forces' contribution, developing legal regimes, or the armed forces' contribution to the operational preparation of civil security.
- **Strengthen the development of 'dual' capabilities:**
 - **Air transport is a priority capability:** continue to develop air transport (helicopter vertical lift, reconnaissance), develop vertical take-off refuelling drone systems, with the aim of saving helicopters.
 - **Land transport capabilities:** modernising the fleet of transport vehicles and acquiring robots.
 - **Maritime transport and support capabilities:** continue to renew the second-tier fleet and maintain the standard amphibious landing craft programme.
 - **Other more specialised dual capabilities to be prioritised:** strengthen ISR capabilities, strengthen engineering capabilities, equip with additional mobile water treatment plant, additional energy support capabilities (SMR), strengthen Armed Forces Health Service capabilities, preserve or strengthen the Joint Environmental Action Center's civil-military cooperation capabilities.
- **Strengthen the first-level operational reserve of the armed forces:** specialized reserve units (USRs) and basic reserve units (UERs), promote and attract reservists, and equip them with vehicles.



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