

“Climate change and security”, [Inquiry](#) by the Environment Audit Committee, House of Commons, written evidence by Professor Basil Germond

THIS EVIDENCE FOCUSES ON CLIMATE CHANGE EFFECTS ON THE OCEAN AND THEIR IMPACTS ON THE UK'S SECURITY

Information on the respondent

Professor Basil Germond is chair in International Security at Lancaster University with 20 years of experience as a researcher in naval and maritime affairs. He has widely published on maritime security, seapower, navies, and the maritime dimension of the UK's security. He participated in the consultation process for the drafting of the 2022 UK *National Strategy for Maritime Security* regarding the climate change-maritime security nexus and gave oral evidence to the Environmental Audit Sub-Committee on Polar Research regarding climate change and geopolitics in the Arctic. This evidence is based on his academic knowledge and understanding of the issue and is given in a personal capacity¹.

Executive summary

- The UK's security and prosperity depend on a safe and stable maritime order.
- The combined effects of climate change on marine ecosystems and rising geopolitical tensions threaten freedom of navigation and maritime security.
- UK critical maritime infrastructures and overseas territories are also at risk from the direct effects of climate change such as sea level rise and extreme weather events.
- Preventing, mitigating, and responding to these threats requires targeted investments in naval forces, maritime domain awareness, early warning capabilities, and infrastructural protection.

1. Introduction: the climate-ocean-security nexus

Climate change threatens the UK's security via its effects on the ocean. Three interrelated factors are at play:

- 1.1. **The UK's prosperity and security strongly depend on the sea** and on a stable and secure maritime order. The UK's economic security depends on the free flow of goods and thus on the security and safety of the global (maritime) supply and value chains as well as on the security of critical maritime infrastructures (communication cables, pipelines, oil rigs, ports)². Maritime transport accounts for about 95% of the UK's trade (imports and exports) by volume³. Moreover, the functioning of the UK's service industry depends on timely and unimpeded access to goods and components imported by sea (e.g., semi-conductors) and on the free flow of information/data that relies on undersea communication cables.
- 1.2. **The ocean has become a more dangerous place to operate** due to the proliferation of criminal actors and politically motivated disruptors (such as Russia and Iran or their proxies such as the Houthi rebels). Any disruption of freedom of navigation negatively impacts on economic security. Additionally, the ability of the collective West to project power and forces and to control the global ocean is challenged by forces of authoritarianism⁴.

¹ Lancaster University webpages for [Professor Basil Germond](#).

² Basil Germond (2024), Oral evidence given to the Joint Committee on the National Security Strategy on “The UK's economy security”, 26 February 2024 (transcripts available [online](#)).

³ Department for Transport (2021), *UK Port Freight Statistics: 2020*, Statistical Release, 14 July 2021 (accessed [online](#)), p.2.

- 1.3. **Climate change and its effects on the ocean are adding pressures** on an already fragile marine ecosystem and unstable maritime domain. This creates further challenges in terms of sustainability and resilience of the UK's supply chain while incentivizing disruptive behaviours and criminal activities⁵.

2. **Impacts on the UK's security**

There are four main impacts of climate change on the UK's security via its effects on the ocean:

- 2.1. **Ocean resiliency, provision of services and economic security**: The ocean is an important source of food (protein), and a provider of services (provisioning, transportation, energy, tourism). It also plays an important role as a climate regulator (ocean-climate nexus)⁶. The effects of climate change degrade the ocean's ability to play its regulatory role while creating more pressures on the ecosystems which are already under stress because of other sources of pollution (e.g., chemical waste, plastic) and overfishing practices. **A degradation of the ocean's capacity to regulate climate and to provide services negatively impacts on the UK's economic security**. In other words, climate change threatens ocean resiliency, which in turn affects the UK's economic security by degrading the ocean's ability to provide services. Additionally, the increase in **extreme weather events is detrimental to maritime trade** due to their effects on port operations and safety of shipping lanes.
- 2.2. **Freedom of navigation and stability of the maritime order**: The effects of climate change on natural/earth systems (e.g., loss of biodiversity) have, further down the line, impacts on human systems (e.g., health and wellbeing). Indeed, changes in ocean temperatures, currents and salinity generate changes in size and distribution of fish stock as well as a degradation of coastal agricultural lands. Then, this affects coastal communities' livelihood and wellbeing. Such societal impacts are wide ranging from food shortages, health issues, poverty and inequalities to resentment, grievance, **maritime crime**, and violence⁷. For instance, in the face of food shortages, coastal communities might be dragged into piratical activities as an alternative source of income; the effects of climate change can also result in an increase in irregular migration and people smuggling. Additionally, the impacts of climate change on coastal regions can combine with existing geopolitical tensions. For example, climate change **exacerbates geopolitical rivalries** in the Arctic⁸; the melting of the polar ice cap makes the Northern Sea Route more attractive as an alternative or complement to the Suez-Malacca route, but this also reinforces dividing lines: Russia is trying to assert sovereign control over

⁴ Basil Germond (2024), *Seapower in the Post-Modern World*, McGill-Queens University Press, Montreal & Kingston, London and Chicago; see also HMG (2023), *Integrated Review Refresh 2023: Responding to a more contested and volatile world*, Presented to Parliament by the Prime Minister by Command of His Majesty, March 2023, CP811 (accessed [online](#)); see in particular: Pillar 1, para 36 (p.29); MoD (2023), *Defence's response to a more contested and volatile world*, Presented to Parliament by the Secretary of State for Defence by Command of His Majesty, 18th July 2023, CP901 (accessed [online](#)), pp.40-41; 92.

⁵ James Brennan and Basil Germond (2024), "A methodology for analysing the impacts of climate change on maritime security", *Climatic Change*, 177(1) (available [open access](#)).

⁶ Celine Germond-Duret, Basil Germond, Stelios Katsanevakis, Miriah Kelly, Antonios D. Mazaris and Emma McKinley (2024), "Thinking outside the ocean-climate nexus: Towards systems-informed decision making in a rapidly changing world", *Science of the Total Environment*, 910, 168228 ([pre-print version](#) available).

⁷ Brennan and Germond, *op.cit.*; Basil Germond and Antonios Mazaris (2019), "Climate change and maritime security", *Marine Policy*, 99, pp.262-266.

⁸ Basil Germond (2023), Oral evidence given to the Environmental Audit Sub-Committee on Polar Research, 24 May 2023 (transcripts available [online](#)).

the Arctic, including for the purpose of resource extraction and fishing rights, and China's presence increases.

Increased maritime crime, heightened geopolitical tensions and **further instability in the maritime domain create additional challenges for the rule of law, ocean governance, and freedom of navigation, and erodes the stability of the global maritime order**. Volatility of the global maritime supply and value chains then negatively impacts on the UK's economic security (c.f. 1.1). Additionally, responding to the increase in maritime crime and to more frequent natural disasters and helping partners in the Global South **requires resources for capacity building, HADR (Humanitarian Assistance and Disaster Relief), policing and patrolling**. This puts pressures on the UK's armed forces in general and the Royal Navy in particular⁹.

- 2.3. **Direct threats to the UK's critical infrastructures**: Climate change effects include sea level rise and more frequent extreme weather events. This can have direct impacts on the UK's **defence infrastructures**. For instance, concerns were raised in 2017 regarding HMNB Clyde being at risk of inundation¹⁰; in this instance, the MoD's risk assessment is reassuring, since "the facilities are assessed against a design basis allowing for a change in Faslane water levels of over four metres"¹¹ and thus "HMNB Clyde's Sea Defences are adequate to meet potential sea level changes"¹². Yet, this highlights both the key importance of robust and trustworthy risk assessment mechanisms and the need to continuously invest in infrastructural protection. **Oil rigs and offshore windfarms** are also at increasing risks of damage due to waves height and extreme weather events, which necessitates remedial measures¹³. Additionally, such infrastructural effects of climate change are likely to affect UK allies and partners in other regions thus degrading their capabilities in support of the collective West.
- 2.4. **British Overseas Territories**: They are strategically **important**, hosting military **bases** that enable forward presence (e.g., Diego Garcia), commanding strategic **choke points** (e.g., Gibraltar), or being subject to sovereignty claims by another state (e.g., the Falklands). Yet, they are at risk due to **sea level rise, dependence of local populations on the sea for livelihood**, and, in some instances, their proximity to **instable regions**. Thus, the Royal Navy needs to have long-term capabilities to swiftly deploy assets to overseas territories, whether for **disaster relief, assistance to civilian authorities**, humanitarian operations, or the defence of British **sovereignty**.

3. **Mechanisms and capabilities to prevent, pre-empt and respond to threats**

- 3.1. **A cumulative risk assessment**: The cumulative effects of climate change and their impacts on security in the maritime domain are complex and act in a synergistic way, combining with other factors such as regional instability and great power politics. Once potential threats exacerbated by climate change are identified (such as maritime crime, disruption of freedom of navigation,

⁹ Basil Germond (2022), Written evidence submitted to the House of Lords' International Relations and Defence Committee, Inquiry on "Defence concepts and capabilities: from aspiration to reality", 11.8.2022 (accessed [online](#)).

¹⁰ J. Hansom, F. Maxwell, L. Naylor and M. Piedra (2017), *Impacts of sea-level rise and storm surges due to climate change in the Firth of Clyde*, Scottish Natural Heritage, Commissioned Report No.891 (accessed [online](#)), p.121.

¹¹ MoD (2020), Response to FOI request, FOI2019/13198 (accessed [online](#)).

¹² House of Commons (2022), Clyde Naval Base: Flood Control, Question for Ministry of Defence, UIN 157504, tabled on 21 April 2022 by Dave Doogan and answered by Jeremy Quin on 27 April 2022 (accessed [online](#)).

¹³ J. Side, R. Harris, D. Woolf, M. Bell and A. Brooks (2013) Impacts of climate change on built structures (offshore), *MCCIP Science Review* 2013, pp.295-301 (accessed [online](#)).

geopolitical instabilities, infrastructural damages), the next step is to proceed with a cumulative risk assessment to account for the additive and multiplicative effects of climate change on security in the maritime domain and their impacts on the UK's defence and security.

- 3.2. **Preventing and pre-empting threats:** Whereas the effects of climate change can be mitigated by global climate policies (in particular a reduction of global CO2 emissions), specific threats arising from the effects of climate change on the ocean (e.g., illegal fishing, piracy) can be prevented or pre-empted by developing relevant capabilities (c.f. 3.4 below) and engaging with partners (in particular in the Global South) with security sector reforms (SSR) and targeted forms of development assistance.
- 3.3. **Domain awareness and early warning mechanisms:** Responding to climate-induced threats to maritime security and to the stability of the maritime order requires comprehensive and timely intelligence and information. Early warning capability and maritime domain awareness (MDA) are key. Yet, the ocean is vast, and the complexity of the processes identified above makes it difficult to establish and maintain an up-to-date intelligence and operational picture. The use of uncrewed/autonomous vessels to improve MDA at a global level and in partnership with allies and like-minded states as well as coordination mechanisms (at national and international levels – whole-of-government/whole-system approach) will be key to improving awareness of rising maritime crime and disruptive activities as well as to identify areas for intervention. As for early warning, the use of satellites for observation and AI models for prediction of storms and other extreme weather events¹⁴ will improve reaction time and efficacy.
- 3.4. **Intervention capabilities:** The UK needs to be able to address threats as far away from the UK as possible and as soon as they materialise. This necessitates rapid response mechanisms and intervention capabilities adapted to the changing operating environment, including the ability to operate at sea under challenging weather conditions, “such as thunderstorms, tornadoes, hurricanes, monsoons or typhoons”¹⁵ as well as icebreakers to operate in the High North¹⁶. As noted by the Defence Select Committee in its 2021 report, the Royal Navy's resources are already overstretched¹⁷. Responding to climate change-induced challenges in addition to the increasing solicitation of the navy to face the challenges posed by adversaries and their proxies at sea will necessitate targeted investments in naval capabilities.
- 3.5. **Mitigation capabilities at home:** Direct effects on port operations, naval bases and other critical infrastructures require continuous investments to protect them and mitigate the forthcoming (and hard to predict) effects of extreme weather events and sea level rise at home and overseas (infrastructural protection programmes.).

¹⁴ CORDIS, EU research results, “State-of-the-art Earth explorer tracks storms before they hit” (accessed [online](#)).

¹⁵ James L. Regens (2024), “Extreme Weather Risk to Military Operations in a Changing Climate”, *The RUSI Journal*, p.6.

¹⁶ Basil Germond (2023), Written evidence submitted to the House of Commons' Scottish Affairs Committee on “Defence in Scotland” (accessed [online](#)) and cited in the Committee's Report: House of Commons, Scottish Affairs Committee (2023), Defence in Scotland: the North Atlantic and the High North, Seventh Report of Session 2022–23, Ordered by the House of Commons to be printed 10 July 2023, HC 1576 (accessed [online](#)), para 17; Defence Committee (House of Commons), Oral evidence ‘Defence and Climate Change, HC 179’ by Lieutenant General Richard Nugee, (Retired), Lead, Ministry of Defence's 2021 Climate Change and Sustainability Review, 22 November 2022 (accessed [online](#)) Q49.

¹⁷ House of Commons, Defence Committee (2021), *We're going to need a bigger Navy*, Third Report of Session 2021–22, Ordered by the House of Commons to be printed 7 December 2021, HC 168 (accessed [online](#)), para 44-48.

4. Recommendations

4.1. Targeted investments: HM Government's future response to the above-mentioned risks and threats will depend on the quality of information and understanding about the complex mechanisms at play (including the cumulative and synergistic nature of the effects of climate change on security and defence).

4.1.1. HM Government should prioritize the procurement of **naval capabilities** to operate under challenging weather conditions, as well as MDA and early warning capabilities (including the development of autonomous/uncrewed vessels). It is also important to have enough platforms to devote to HADR operations far away from the UK.

4.1.2. Informed by tested and trustworthy risk assessment mechanisms, it is imperative to commit investments to physically **protect and adapt critical infrastructures** as and when needed, including naval bases, ports and offshore rigs and windfarms (including in British Overseas Territories).

4.2. Whole-system governance: A whole-system/whole-of-government approach shall be combined with efficient public-private partnerships (PPP) and international collaboration mechanisms to make the maritime sector more resilient and thus able to adapt to the effects of climate change.

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