

Climate, Ocean, and Security: Response to ocean-driven security challenges

REPORT FROM A WORKSHOP HELD BY STOCKHOLM CLIMATE SECURITY HUB IN NOVEMBER 2020

The profound impacts that global warming and the accelerated melting of the cryosphere are having on ocean temperature and acidity as well as on sea-level rise are increasingly evident. The territorial consequences from sea-level rise could jeopardize

international cooperation, and threaten coastal communities and livelihoods through increased extreme events and saltwater intrusion. At the same time, changes in ocean temperatures are threatening marine ecosystems and food security.



On 6 November 2020, the Stockholm Climate Security Hub organized a science-policy workshop for invited experts and agents of change on the links between climate change, ocean, and security. In cooperation with the Swedish Agency for Marine and Water Management (SWAM) and the Ministry for Foreign Affairs of Sweden (MFA), the workshop brought together key scientists and decision makers from northern Europe to present the latest research in the topic and to discuss how policy based on science could help to address global ocean-related security challenges driven by climate change.

The aim of the workshop was to bring forward existing evidence, flag knowledge gaps, and discuss adaptation and mitigation strategies that different countries and regions are putting in place to deal with the challenges posed by climate-induced security in and by the ocean.

The workshop explored the knowledge needs and the response on two fronts:

1. Consequences from sea-level rise on coastal landscapes and communities; and
2. Consequences from sea-level rise and warmer temperatures on marine territorial delimitations and resource security.

The workshop was organized by the Stockholm Climate Security Hub, which is represented by four organizations: the Stockholm Environment Institute (SEI), Stockholm International Peace Research Institute (SIPRI), Stockholm International Water Institute (SIWI), and Stockholm Resilience Centre (SRC). The workshop was facilitated by Karina Barquet (SEI) and Mats Eriksson (SIWI).

What challenges are we talking about?

While there is an array of potential security implications from climate change, the dialogue focused on exploring the consequences on coastal landscapes and communities, food webs, and marine territorial delimitations. And you guessed it right – it is all connected. But we knew that already; what you might not know is how it is all connected.

Jochen Hinkel – head of Adaptation and Social Learning at the Global Climate Forum and one of the authors of the Intergovernmental Panel on Climate Change (IPCC) report on the ocean and cryosphere – explained that while we know there is a possibility of seeing catastrophic sea-level rise, we do not know exactly how processes such as ice sheets will melt and how that in turn will affect sea level. What we can surely expect is that much suffering in societies will take place during this century. And this suffering will be uneven. We can already see that richer urban centres have coastal defences, but poorer rural coastal areas will increasingly experience more human security challenges as their livelihoods will be affected. For small island states and the 70 per cent of the most climate-vulnerable countries that also happen to be among the most politically fragile countries, this is bound to be a matter of state and collective security.

Take Bangladesh as an example, a country experiencing multiple types of vulnerability, not only linked to climate change but also to political risks, rapid urbanization, and high rates of poverty and inequality, as well as to displacement and migration. Here, climate

What do we mean by security?

There are different understandings of the concept, but three types of security were mentioned by Karina Barquet, SEI:

- **Collective security** is the cooperation of several countries in an alliance to strengthen the security of each. International security issues place demands that no national security apparatus has the capacity to handle on its own and, as such, call for the cooperation of states and international organizations. The referent object is the international or global arena.
- **National security** is the ability of a state to cater for the protection and defence of its citizenry to military and non-military threats. The referent objects here are nation states and their territories.
- **Human security:** the referent object is at the human rather than the national level, as in traditional security studies. Human security has a people-centred and multidisciplinary understanding of security and the referent object is the individual or household level, or the impacts that an issue can have on humans.

impacts on oceans and coasts – largely manifesting in the form of sea-level rise, saltwater intrusion, and changes in ocean temperatures – can have security implications because they will result in the loss of land and livelihoods. In turn, this can lead to massive displacement and forced migration, which can increase the risk of tension and conflict in receiving areas, explained **Beatrice Mosello**, senior advisor at Adelphi. In Bangladesh, a projected one-metre sea-level rise by 2100 would mean that 18 per cent of the country’s land could be wiped out, potentially creating 25 million refugees. Saline intrusion has already reached 26 per cent of Bangladesh’s land mass and is set to increase to 55 per cent by 2050, resulting in the loss of arable land and crops. In a country where 44 per cent of the population is dependent on agriculture, this can have dramatic consequences in terms of food and income insecurity.

But nowhere is the connection between climate, marine ecosystems, and security clearer than in food webs. Professor **Anna Gårdmark** from the Swedish University of Agricultural Sciences showed how, due to warming, oceans now also contain less oxygen, while acidity has increased by over 25 per cent since pre-industrial times. Warmer seas are in turn altering food webs by causing shifts in population structures that favour smaller individuals and put the large predators at risk of collapse. The alteration of food webs is, all in all, lowering global fishery production, but we can also observe regional differences in the forecasted effects on production. Consider the map in Figure 1.

The red areas are going to see decreases in primary fish production (in terms of maximum catch potential) while the blue areas will experience increases (notice how the blue areas are in the higher latitudes). The red areas coincide with the world’s most populated areas, which also have large forecasted demographic increases, explained Gårdmark. The future overall decline and increasing regional differences are thus likely to risk both food security and increased stress on international agreements. Warmer oceans are already impacting global fish markets and local fish industries, on which millions of people globally depend for survival.

Fisheries are not only being affected by temperature and acidity levels. Fisheries – as an economic sector – are bound to become a source of concern for coastal countries globally due to sea-level rise. Now, you might be wondering how these two things are connected. **Clive Schofield**, head of research at the World Maritime University–Sasakawa Global Ocean Institute, guided us through the process of how sea-level rise will impact coastal baselines, maritime limits, and boundaries. Coastal baselines are the international legal representations of the land/sea interface at the coast, which are fundamental to determining the extent of the sea that comes under the jurisdiction of each coastal state. As rising sea levels encroach on physical coastlines, they are also potentially impacting legal baselines, inundating parts of the coast and therefore leading to the loss of land territory as well as shifting the maritime limits inland, and impacting the extent of, for example, Exclusive Economic Zones (EEZ). Countries

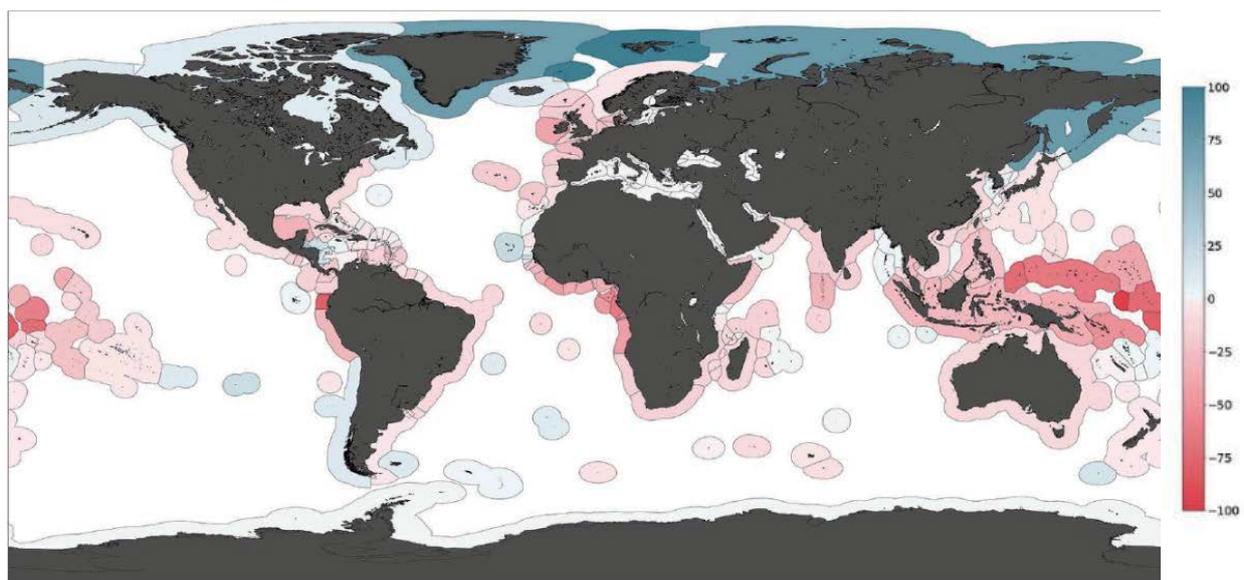


Figure 1. Percentage change in maximum catch potential until 2050 under global warming (the RCP8.5 scenario). Source: FAO (2018). *Impacts of Climate Change on Fisheries and Aquaculture*. Fisheries and Aquaculture Technical Paper 627. Rome: Food and Agriculture Organization of the United Nations.

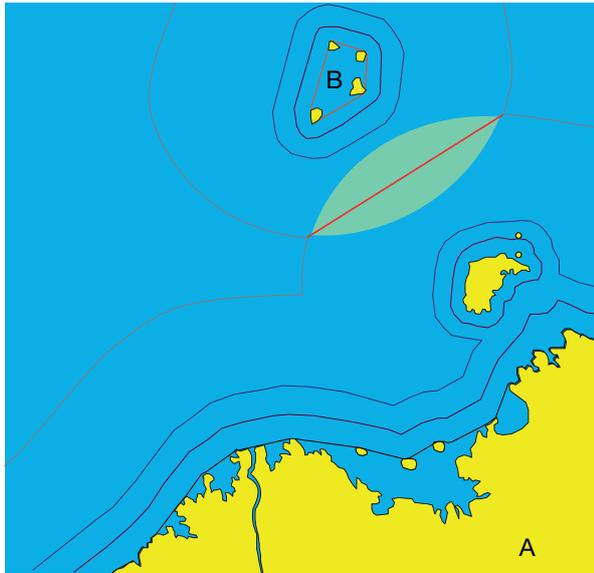


Figure 2. Where coastal states or islands have overlapping EEZs. Image produced by Schofield and Arsana based on the International Hydrographic Organization’s Technical Aspects of the Law of the Sea (TALOS) Manual (fifth edition, 2014). This overlapping is a well-known situation for Pacific nations where sea-level rise is not only threatening land mass but also questioning the extent of maritime claims and the delimitation of maritime boundaries, and thus the right over valuable marine resources.

have the exclusive right to manage and use all natural resources within their EEZ, including fish, minerals, oil, and natural gas. EEZs cover about 39 per cent of the ocean’s surface and account for more than 95 per cent of the global marine fish catch. So you could say they are pretty important, especially for instance to small islands but profoundly to large-ocean developing states. As if sea-level rise was not worrisome enough, a lot of the maritime boundaries between countries are not yet defined. In fact, only just over half of the world’s 512 potential maritime boundaries have been even partially settled. What does this mean? The combination of sea-level rise with unsolved jurisdictions could be potentially explosive and therefore deserves attention.

If there is one region of the world that is well acquainted with the threats from sea-level rise, it is the Pacific region. His Excellency **Andrew Jenks**, New Zealand’s ambassador to Sweden, Norway, Denmark, Finland, and Iceland, noted how, for low-lying countries and atolls, the consequences of sea-level rise could be severe. States with very small land masses might be converted into uninhabitable islands. For instance, the islands of Fiji and Tarawa are already under direct threat from sea-level rise. And just to put the problem into more perspective, small island development states (SIDS) are not insignificant dots

on the map. They are home to 65 million people who are already at risk. For SIDS, “maritime zones are of fundamental importance...they define many local societies,” Jenks said. “For some of these countries, revenues from fish stocks constitute a significant part of their budgets and food systems.”

So what options are there for dealing with these challenges?

Despite the bleak scenario described above, our speakers and workshop participants highlighted concrete research directions and policy actions that provide a glimpse of hope.

Mitigation and adaptation will not stop climate change but can dampen its impacts. But mitigating and adapting will cost us, which means it is important to assess where interventions might be most effective, explained **Jochen Hinkel**. Figure 3 gives results from a study he carried out in 2019, which shows that mitigation efforts could concentrate on 13 per cent of the world’s coasts, inhabited by 90 per cent of the global coastal population. But can we afford this? And, more importantly, who can afford mitigation? Hinkel warns that ensuring security against climate change will increasingly be a matter of wealth. We can thus expect an even more divided world with a sea-level rise of 0.4–2m during the 21st century.

The impacts of sea-level rise on coastlines also places ownership of marine resources at risk. As previously explained, baselines – which follow the water line around the coast – define maritime boundaries. But a move inwards with the shifting coastlines – and if certain base points established by outer islands were to disappear altogether due to sea-level rise – puts many coastal states and islands at risk of losing their marine territories, explained **Jenks**. “The concern in our [Pacific] region is that other states may challenge maritime boundaries of coastal states, due to sea-level rise”, especially in places with already overlapping claims, as shown in Figure 2. So what options do we have? **Schofield** outlined some of the potential legal responses. Option A, as seen in Figure 4, is to freeze the baselines (and limits), which in practice would expand internal waters. Option B is to freeze the outer limits and expand the territorial sea limit. Finally, option C is to freeze the outer limits and expand the EEZ limits. While there are pros and cons with each option, it is increasingly clear, particularly through the practice of Pacific island states, that fixing baselines, limits of maritime zones, and maritime boundaries is the favoured option. However, if baselines and maritime

ECONOMIC EFFICIENCY

13% of the coastline = 90% of coastal population

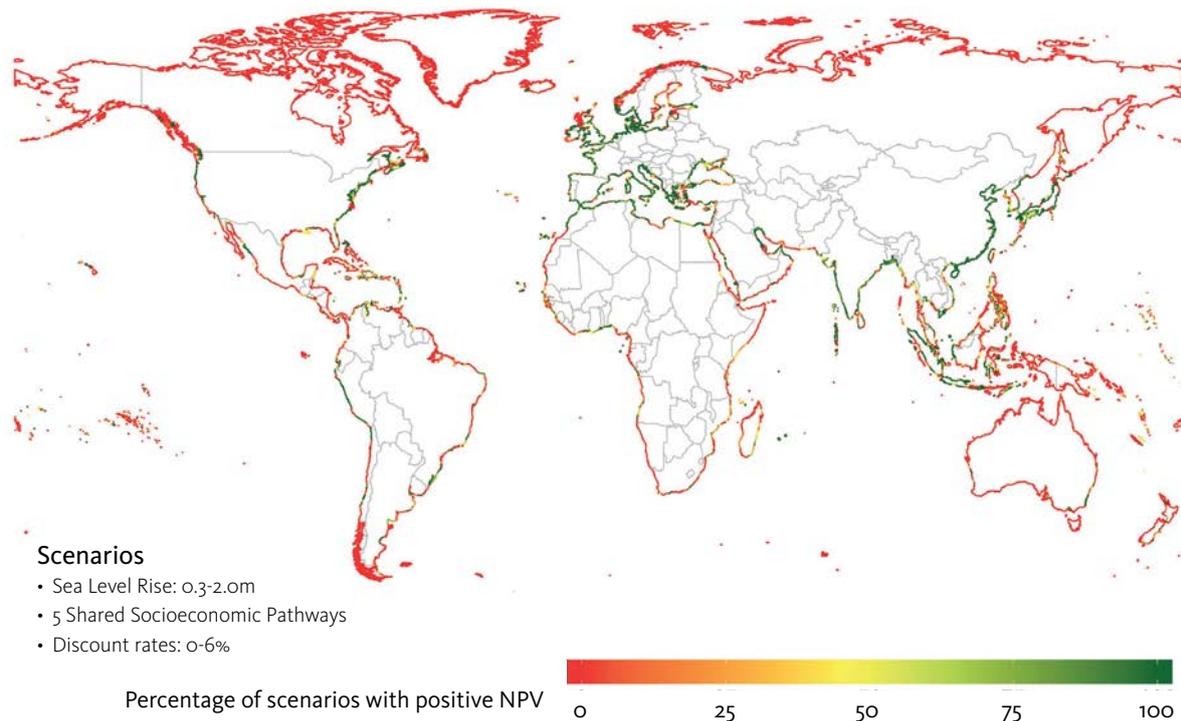


Figure 3. Coastal areas where mitigation and adaptation measures could be more cost-efficient in terms of net present value (NPV, in green). Figure courtesy of Jochen Hinkel.

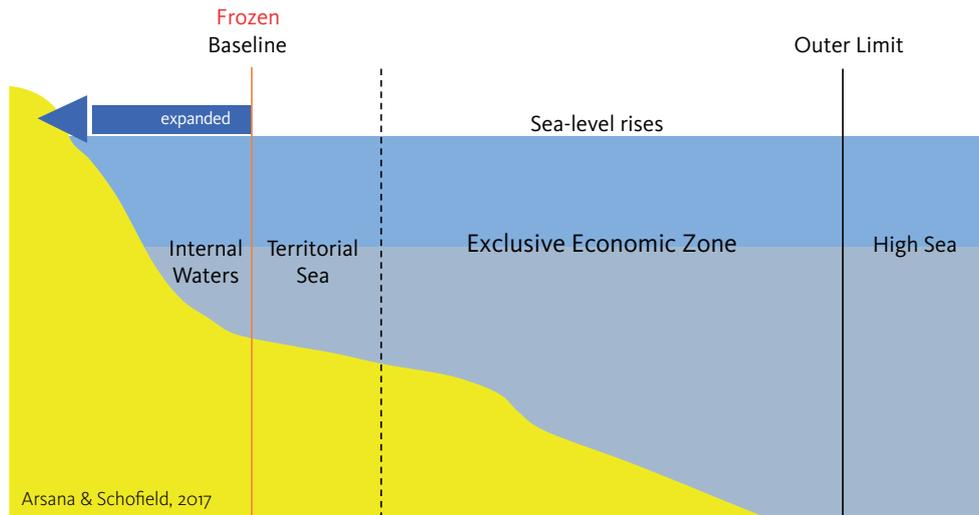
limits were fixed, as suggested in each of the three scenarios, this would depart from the praxis in the law of the sea. In other words, maritime limits and boundaries have historically been established based on land territory and the physical reality of the coastline, in line with the legal maxim that “the land dominates the sea”, but fixing maritime limits and boundaries would increasingly mean a disconnect between them and the actual location of the coast, arguably meaning that the land no longer dominated the sea.

Climate change is not a concern only for Pacific islands. The North and Baltic Seas are some of the fastest-warming large marine ecosystems, explained **Ingela Isaksson**, senior advisor at the international unit of SWAM. The challenges in this region have been met with tools for cooperation for improved marine spatial planning (MSP). These tools are based on extensive stakeholder dialogue among the region’s countries to build scenarios of the future. MSP integrates data on the latest climate models; the presence and absence of key species today, using historical reference data; and predictions for future species distribution given the projected change in structuring factors. Salinity, temperature, and nutrients are also included in the scenarios, explained Isaksson.

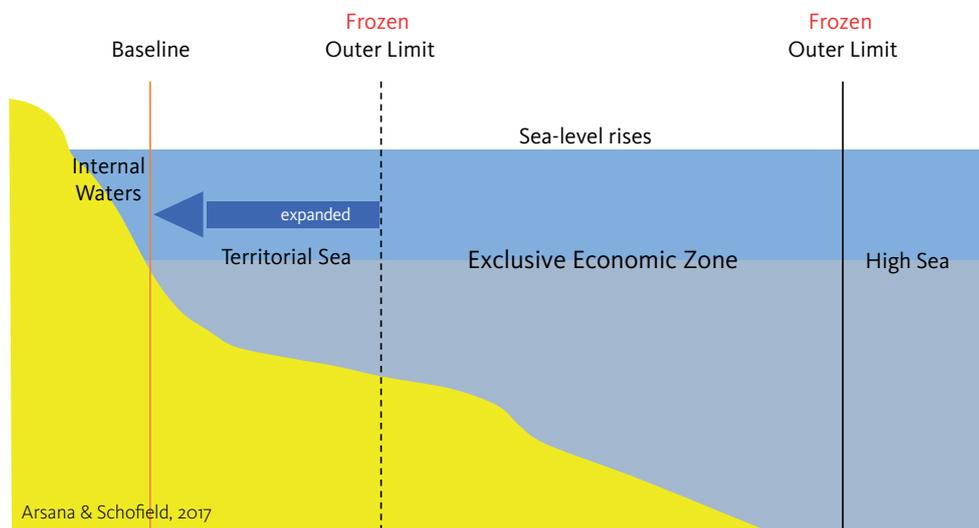
Indeed, regional cooperation for shared resources and phenomena that span borders – like fish, water temperature, and the level of the sea – seems to be the way to go when it comes to addressing marine insecurities and opportunities. An example of this is the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), which turns 40 years in 2021. CCAMLR has 26 member states, including the European Union. The sudden ocean changes and the Antarctic ice sheet play a very important role in the global ecosystem, explained **Jakob Granit**, SWAM director general and the new chair of CCAMLR. “Over the past years, we have seen significant events, including 20 degrees Celsius in Antarctica and large calving of icebergs. These events are happening much more rapidly than we previously have seen”, explained Granit. To improve our understanding of the impacts that climate change will have on the ocean globally, it is crucial to continue carrying out research in cooperation with all other members. CCAMLR has been, and will continue to be, an important vehicle for this.

Sweden is not only playing an important role in the Antarctic. The country’s official stance has also been that of continually raising the level of ambition in international cooperation by incorporating conflict

A: FREEZING BASELINES



B: FREEZING OUTER LIMITS: TERRITORIAL SEA



C: FREEZING OUTER LIMITS: EEZ

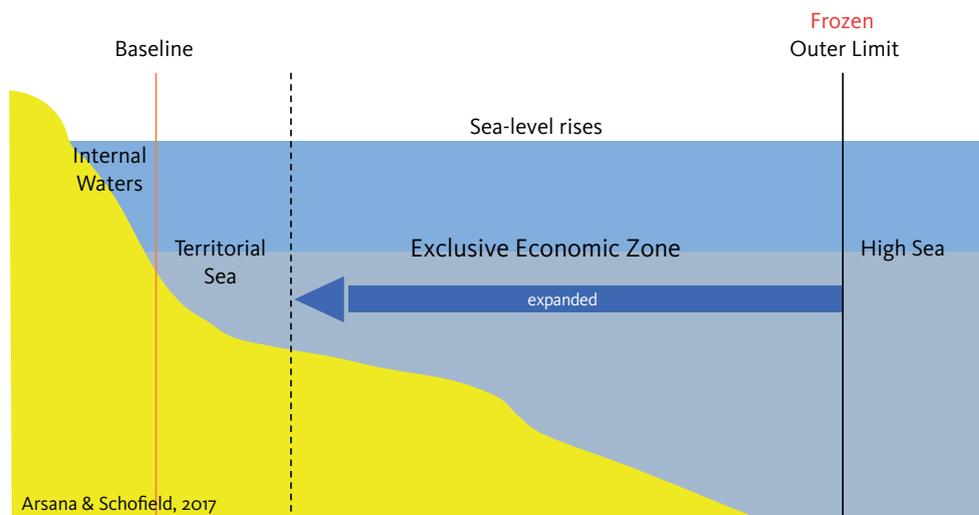


Figure 4. Potential legal responses to sea-level rise may require freezing maritime baselines, limits, and boundaries to prevent countries from losing jurisdiction over their maritime areas. Option A entails freezing the baselines along the coast and therefore all maritime zones measured from them. Option B suggests freezing the limits of the territorial sea. Option C would freeze the limits of EEZ. Figures provided by Schofield and Arsana.

prevention, and gender and social equity into broader discussions on ocean sustainability and adaptation to climate change. “The effect of climate change was identified as one of the major threats in the national security strategy in 2017 and, a year later, Sweden presented its first bill on climate change adaptation,” explained Her Excellency **Helen Ågren**, Ambassador for Ocean Affairs at the Swedish Ministry for Foreign Affairs. “However, it is the poorest and most vulnerable that are hit the hardest by climate change, so we have a great responsibility to assist communities and countries in need. We are facing hundreds of millions of people potentially being refugees from climate change.” Ågren concluded: “When we talk about climate, the ocean and security, we need research on investment needs for adaptation, but also aligning global work to national policies and measures. We need to take into consideration consumption and production patterns when we think about ocean sustainability and the blue economy, and ensure coordination within ministries and governments, and with local communities.”

Concluding remarks, and future policy and research avenues

It is obvious that climate change is impacting the ocean, with serious implications for marine life, coastal communities, and natural resources. These are in turn jeopardizing food and water security as well as the loss of land and livelihoods. Actions for addressing these insecurities and their cascading effects on ecosystems and populations require further exploration.

It is likely that the impact on coasts and coastal communities will increase the gaps between countries and regions that have the ability, resources, and means to adapt to rising sea levels, and those that do not have such resources to hand. The impact will further aggravate the differences between rich and poor regions. The costs, effectiveness, and possibilities for mitigating and adapting should therefore consider a social-equity approach.

Increased temperatures and changes in oxygen levels are having profoundly negative impacts on marine life in tropical seas, while a shift of temperate-water fish populations towards the polar regions can be expected. Severe impacts on the fishing communities and countries that are dependent on marine resources can therefore also be expected. Again, poor countries in tropical regions will be hit the hardest. A better understanding of the winning and losing species in different regions, the impacts that these will have on ecosystems and livelihoods, and the responses required to adapt to changing food webs is necessary.

Finally, changes to maritime limits, including EEZs, due to shifting coastlines may further aggravate existing tensions and disputes over vaguely defined maritime boundaries. The collective impact on societies worldwide from climate-driven ocean-related hazards and changes demand an increased, targeted, and coordinated response to these transboundary global challenges. Foreign policy, official development assistance, MSP, and active participation in global treaties such as the CCAMLR will all provide important avenues for the global community to prepare for the increased challenges to come.

The workshop was organized by the Stockholm Climate Security Hub, which provides evidence-based insights on building security and prosperity, and strengthening resilience in the face of a changing climate. It combines the strengths of four leading research institutes: Stockholm Environment Institute (SEI), Stockholm International Water Institute (SIWI), Stockholm International Peace Research Institute (SIPRI), and Stockholm Resilience Centre at Stockholm University (SRC). The Hub is funded by the Swedish Ministry for Foreign Affairs.

This workshop report was authored in November 2020 by Karina Barquet, Ylva Rylander (SEI), and Mats Eriksson (SIWI), with contributions from Susa Niiranen (SRC) and Vane Aminga (SIPRI).

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