Annex. Security Risks of Environmental Crises: Environment of Peace Part 2

These papers were commissioned to inform the research and analysis of the Environment of Peace initiative. They have not been through SIPRI's formal editorial process.

Contents

1. Security and Climate Change in the Arctic

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As more evidence of the effects of climate change on the global environment appears, it has been underscored that the Polar Regions are bearing the brunt of these changes in temperature and weather patterns.[1] Melting ice and permafrost, warmer conditions, weather extremes, wildfires, and physical and biological changes are being observed with greater regularity at both poles, but in the Far North, with approximately four million people living above the Arctic Circle, climate change has taken on a much more pronounced security dimension. Discussions about the amplification effects of these changes, as well as whether the Arctic has reached a 'tipping point', have become commonplace.[2] As a result, countries in the Arctic, including great powers the United States and the Russian Federation, are crafting policy in relation to strategic risks. At the same time, non-Arctic states, including countries as disparate as Britain, China, Germany, India and Japan, are also beginning to perceive the Arctic as current or potential sources of insecurity.

Security risks in the Arctic have begun to fall under two distinct but connected categories, with both being directly connected to climate change phenomena.[3] The first can be referred to as regional human or 'non-traditional' security, given that the threats are directly towards sub-state or non-state actors, including communities (and Indigenous peoples) and individuals, and are non-military in nature.[4] As the Arctic continues to warm, there have been effects on not only traditional lifestyles and customs but also on food security and out-migration. Many specific effects of climate change, including the loss of permafrost, have had effects on local communities. It has been predicted that the *population* of the Arctic will not grow at similar rates as other parts of the world (and this process will be uneven), and there will be trends towards greater urbanization and older populations.[5] Other aspects of individual-level security in the Arctic, such as those pertaining to development, education and health, have intersected with the environmental changes in the Far North, and the post-2020 coronavirus pandemic has further underscored the fragility and isolation of the region.

It can be argued for much of the immediate post-cold war period and arguably up until about a decade ago, it was this interpretation of security which dominated much of the policy discourse in the Arctic, leading to the concept of 'Arctic exceptionalism', namely that the region was insulated from the 'traditional' hard security concerns found elsewhere in the world.[6] Forms of cooperation, including the Arctic Council and various initiatives designed to promote cooperation in the Far North, were cited as proof that this region presented too negative a cost-benefit ratio for overt competition. The validity of 'Arctic exceptionalism' has been a subject of much debate.[7] Regardless, the widespread perception at present is that traditional security has 'returned' to the

[1] Fox-Kemper, B. et al. 'Ocean, cryosphere and sea level change', eds V. Masson-Delmotte et al., *Climate Change 2021: The Physical Science Basis: Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*, IPCC (Cambridge University Press: Cambridge and New York, 2021), pp. 1211–1362; Moon, T. A. et al., 'The expanding footprint of rapid Arctic change', *Earth's Future*, vol. 7, no. 3 (Mar. 2019), pp. 212–18; and Witze, A., 'The Arctic is burning like never before—and that's bad news for climate change', *Nature*, 10 Sep. 2020.

[2] England, M. R. et al., 'The recent emergence of Arctic amplification', *Geophysical Research Letters*, vol. 48, no. 15 (Aug. 2021); Dai, A. et al., 'Arctic amplification is caused by sea-ice loss under increasing CO2', *Nature Communications*, vol. 10, no. 121 (2019); AFP, 'Irreversible warming tipping point may have been triggered: Arctic mission chief', France 24, 15 June 2021; and Serreze, M. C., 'Rethinking the sea-ice tipping point', *Nature*, vol. 471 (2011), pp. 47–48.

[3] Lanteigne, M., 'Whose Arctic security is it anyway?', Over the Circle, 14 Sep. 2020.

[4] Hoogensen Gjørv, G., 'Virtuous imperialism or shared global objective: The relevance of human security in the global North', eds G. Hoogensen Gjørv et al., *Environmental and Human Security in the Arctic* (Routledge: London and New York, 2014), pp. 58–80; Nicol, H. N. and Heininen, L., 'Human security, the Arctic Council and climate change: Competition or co-existence?', *Polar Record*, vol. 50, no. 252 (2014), pp. 80–85; and Kuokkenen, R. and Sweet, V., 'Indigenous security theory: Intersectional analysis from the bottom up', eds G. Hoogensen Gjørv, M. Lanteigne and H. Sam-Aggrey, *Routledge Handbook of Arctic Security* (Routledge: London, 2020), pp. 80–90.

[5] Heleniak, T., 'The future of the Arctic populations', *Polar Geography*, vol. 44, no. 2 (2021), pp. 136–52.

[6] Hoogensen Gjørv, G. and Hodgson, K. K., '"Arctic exceptionalism" or "comprehensive security"? Understanding security in the Arctic', *Arctic Yearbook*, 2019, pp. 218–30.

[7] Huebert, R., 'A new cold war in the Arctic?! The old one never ended!', *Arctic Yearbook*, 2019; Heininen, L., 'Arctic geopolitics from classical to critical approach: Importance of immaterial factors', *Geography, Environment, Sustainability*, vol. 11, no. 1 (2018); and

Arctic in the form of questions about rivalries over resources and influence in regional affairs, involving both Arctic and non-Arctic actors.

This present situation illustrates the second category of security risks in the Arctic, involving the region as a potential contested space as the economic benefits of the region slowly but steadily appear. As the ice cap surrounding the North Pole becomes smaller and smaller,[8] especially in summer months, access to various resources and transportation routes have caught the attention of several governments. The concern, however, is that this trend in security thinking has raised the risk of 'zero-sum' thinking in the region regarding security, as opposed to the 'positive-sum' (everyone can win) concept which has marked many aspects of regional cooperation, including within the Arctic Council, to address human security and environmental threats in the Arctic.

For example, the prospect of extracting fossil fuels in the Arctic became more attractive at the turn of the century, until the first contemporary drop in global fuel prices in 2014, (with the second being in 2020 as the Covid-19 pandemic began to intensify, halting much global travel).[9] With the pace of the post-coronavirus economy uncertain, there is nonetheless a 'watch and wait' attitude regarding the attractiveness of developing further onshore and offshore oil and gas projects in the Arctic Ocean region, with some governments, notably Norway and Russia, retaining optimism that global demand for oil will rebound to the point where Arctic drilling again becomes viable and profitable.[10] The onus is on Moscow in particular to develop oil and gas in the Russian Far East and Siberia in the hopes of reviving the country's financial fortunes despite ongoing economic pressure from the West. If there is dramatic rebound in fossil fuel demand in the short term,[11] this will place considerable pressure on Arctic governments to again consider the Far North as ready to be opened more fully for extractive industries, despite environmental concerns and questions about the effects on local populations.

In addition to energy, other raw materials have become more reachable in the Arctic, with one example being the ongoing attractiveness of Greenland as a source of several key metals and minerals, including rare earth elements (REE) essential for high technology and 'green tech' applications. Access to REEs has become greatly securitized of late in response to the worsening diplomatic situation between the United States, its allies, and China, with the latter being a major source of rare earths for the global market.[12] The mineral wealth found in Greenland, which is now seen as well within reach due to the erosion of the country's vast ice sheet as well as the loss of surrounding sea ice, has caught the attention of many governments, including the United States and China, and has also factored into the current debate in the country about the timetable for independence from the Kingdom of Denmark. Under the terms of the 2009 Self-Rule Act between Copenhagen and Nuuk, Greenland had achieved the right to self-determination and to declare independence but with Copenhagen currently retaining oversight of Greenland's defence and foreign policy.[13] The interest by Chinese firms in Greenlandic investments has prompted jitters in both Denmark and the US, while the hapless attempt by the Trump administration to outright purchase Greenland from Denmark in 2019 further underscored the security implications of access to the island's resources.[14] The current Greenlandic government under Prime Minister Múte Egede has sought to dampen plans for future mining and oil drilling on environmental grounds,[15] but it remains to be seen whether this policy can be maintained under increased international pressures.

Käpylä, J. and Mikkola, H., 'Contemporary Arctic meets world politics: Rethinking Arctic exceptionalism in the Age of Uncertainty', eds M. Finger and L. Heininen, *The Global Arctic Handbook* (Springer International: Cham, 2019), pp. 153–69.

[8] 'Arctic sea ice at maximum extent for 2021', US National Snow and Ice Data Centre, 21 Mar. 2021.

[9] Lanteigne, M., 'Hello zero: Where does Arctic energy go from here?', Over the Circle, 26 Apr. 2020.

[10] Staalesen, A., 'Drilling on the Arctic beach: Russian oil companies bid for licenses along Russia's remotest and most vulnerable shores', Barents Observer, 23 Sep. 2021; and Buli, N. and Solsvik, T., 'Norway awards Arctic oil exploration permits, but fewer firms apply', Reuters, 23 June 2021.

[11] Lockett, H. et al., 'Oil prices rise above $80 a barrel for first time in three years', *Financial Times*, 28 Sep. 2021.

[12] Menezes, D. R., *The Case for a Five Eyes Critical Minerals Alliance: Focus on Greenland* (Polar Research and Policy Initiative: London, 2021).

[13] Act on Greenland Self-Government, Act no. 473 of 12 June 2009, *Naalakkersuisut: Greenland*.

[14] Shi, M. and Lanteigne, M., 'The (many) roles of Greenland in China's developing Arctic policy', The Diplomat, 30 Mar. 2018; and Lucht, H., 'Chinese investments in Greenland raise US concerns', Danish Institute of International Studies (DIIS), DIIS Policy Brief, Nov. 2018; Salama, V. et al., 'President Trump eyes a new real-estate purchase: Greenland', *Wall Street Journal*, 16 Aug. 2019; and Noack, R., 'A Ukrainian twist in Trump's Greenland "debacle" has Danes puzzled', *Washington Post*, 7 Nov. 2019.

[15] Kwai, I., 'Opposition wins Greenland election after running against rare earths mine', *New York Times*, 7 Apr. 2021; 'Greenland suspends oil exploration because of climate change', Associated Press, 16 July 2021; and Shi, M. and Lanteigne, M., 'Turning off the taps? Greenland says no to oil development plans', Over the Circle, 2 Aug. 2021.

Another implication of the loss of the Arctic ice cap has been greater access to northern fish stocks, which had traditionally been a sore point in regional diplomacy (with notorious examples being the 'cod war' disputes between Britain and Iceland between the 1950s and 1970s). At the same time, there is the question of sub-Arctic stocks moving further northwards as Arctic waters continue to warm.[16] However, in June 2021, the 'International Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean' (CAO) officially came into effect, placing a moratorium on commercial fishing in the area for 16 years, with options to renew. In addition to being supported by Arctic littoral states (Canada, Denmark/Greenland, Iceland, Norway and Russia), the pact was also supported by China, the European Union, Japan and South Korea.[17] This agreement may very well emerge as an early 'acid test' to determine how developing environmental agreements in the Arctic can withstand economic pressures.

In addition to the resources themselves, the opportunities which the opening of the Arctic Ocean presents to the international community include the appearance of new transit routes which may eventually connect East Asia, Northern Europe and North America, depending on future ice conditions and the availability of needed infrastructure, which at present is lacking in many parts of the region. Long considered impassable due to ice conditions, Arctic passages including the Northern Sea Route (NSR) connecting Asia and Europe via Siberian waters (and primarily made up of the Russian northern coastline) and the Northwest Passage (NWP) in the Canadian Arctic Archipelago are now being viewed as emerging secondary maritime routes. This has created new possibilities for joint cooperating in monitoring, including via the Arctic Council's regional agreement on search and rescue, launched in 2011.[18] However, this situation also presents political and legal complications, including over regional sovereignty and the potential for militarization, as these routes are perceived to be assets in need of protection from outside interference. The Putin government has placed a great deal of emphasis on developing the NSR as part of a developing 'Polar Silk Road' in partnership with China and has begun to move military personnel and material to Siberia to better monitor the region. China, in turn, sees the NSR as a future northern tier of the Belt and Road Initiative, as well as a secondary trade route less susceptible to interdiction than traditional routes via the Indian Ocean[19] In keeping with the concept of the 'security dilemma', however, these moves, which Moscow has stressed are for defensive purposes, have nonetheless been interpreted by the US and its NATO allies as assertive in nature, while NATO itself has looked for ways to respond.[20] The result is the strong possibility of military competition for influence over ever-expanding areas of open water in the Arctic.

From a legal viewpoint, disputes over maritime boundaries, which were long considered of low priority, have been pushed to the forefront in regional affairs due to more of the Arctic being navigable for longer durations. These include the dispute between Russia, Canada, and Denmark/Greenland over the legal status of the Lomonosov Ridge, an underwater feature which stretches to the North Pole itself, as is claimed by all three actors as extensions of their respective continental shelves. A verdict on this matter would have considerable implications for both the economic and the political future of the region, especially given the high priority which Moscow has placed on developing its part of the Arctic. In addition, the status of the NWP has been a longstanding point of contention between Ottawa and Washington, with the former perceiving the passage as internal waters while the latter maintaining that it is an international waterway. There had been a tacit 'agree to disagree' stance between the two governments, which was rattled when then-US Secretary of State Mike Pompeo referred to Canadian claims as 'illegitimate' in a 2019 speech.[21]

[16] Steinsson, S., 'Neoclassical realism in the North Atlantic: Explaining behaviors and outcomes in the cod wars', *Foreign Policy Analysis*, vol. 13 (2017), pp. 599–617; and Uryupova, E., 'Why do we need a shared Pan-Arctic Fisheries Governance Complex?', Arctic Institute, 27 Apr. 2021.

[17] Quinn, E., 'Central Arctic Ocean fishing moratorium comes into effect', Barents Observer, 28 June 2021.

[18] Arctic Council, 'Agreement on cooperation on aeronautical and maritime search and rescue in the Arctic', 2011.

[19] Rumer, E., Sokolsky, R., and Stronski, P., *Russia in the Arctic—A Critical Examination* (Carnegie Endowment for International Peace: Washington, DC, Mar. 2021); and Lanteigne, M., 'Only connect? The Polar Silk Road and China's geoeconomic policies', eds B. Gaens, F. Jüris and K. Raik, *Nordic–Baltic Connectivity with Asia Via the Arctic: Assessing Opportunities and Risks* (International Centre for Defence and Security: Tallinn, 2021), pp. 107–25.

[20] Wither, J. K., 'An Arctic security dilemma: Assessing and mitigating the risk of unintended armed conflict in the High North', *European Security,* June 2021; Kramer, A. E., 'In the Russian Arctic, the first stirrings of a very cold war', *New York Times*, 22 May 2021; Bouffard, T. J. and Rodman, L. L., 'US Arctic security strategies: Balancing strategic and operational dimensions', *Polar Journal*, vol. 11, no. 1 (2021), pp. 160–87; Yin'an, J., '"冰上丝绸之路"多边合作: 机遇、挑战与发展路径', [Multilateral cooperation under the Polar Silk Road framework: Opportunities, challenges and approaches'], *Pacific Journal*, vol. 27, no. 8 (Aug. 2019), pp. 67–77; and Depledge, D., 'NATO and the Arctic: The need for a new approach', *RUSI Journal*, vol. 165, nos. 5–6 (2020), pp. 80–90.

[21] Blanchfield, M., 'Pompeo says Canadian claim to Northwest Passage is "illegitimate"', Canadian Press/CTV News, 6 May 2019.

With the passage opening up for greater potential sea transits, this policy difference will become more difficult to ignore. While these sorts of disputes have remained strictly in the diplomatic realm, the possibility of spillover into the security sphere cannot be discounted, especially if demand for resources intensifies in the near term.

Looking further ahead, there is also the issue of future sovereignty concerns in the Central Arctic, which at present remains largely impassable save for specialized vessels. Predictions have been made that the Central Arctic may become ice-free in summer months as early as 2035,[22] which would not only have considerable environmental implications but also political ones, given that the middle of the Arctic Ocean, often nicknamed the 'doughnut hole', rests outside of the exclusive economic zones of littoral states and in theory would be 'open waters' from a legal perspective. Some states have already begun preparations for the day when ship traffic near the North Pole region becomes a reality. For example, China has indicated, including in its seminal 2018 Arctic policy white paper, that it was seeking to make use of the Central Arctic as a regional maritime trade route when circumstances allow.[23] While it remains unlikely that the Arctic will evolve into a maritime trade corridor to the same degree as, for example, the Indian Ocean, the attractiveness of the Arctic as a time- and fuel-saving link between Northern Hemisphere markets will mean an increase in sea traffic in a region which is already environmentally delicate.

In sum, the economic potential of the Arctic can be observed from several different angles, and this has resulted in a rethinking of the security perceptions of the region by not only Arctic governments but also by several countries outside of the Arctic. China may be at the forefront of non-Arctic states seeking to engage the region, but it is far from alone, as several countries in Asia and Europe have begun to call for a greater say in far northern affairs, pointing in various cases to their long histories of exploration and scientific cooperation in the region, their specific environmental concerns in the Far North, and the need to partner with Arctic states for economic development initiatives.[24] Yet another strategic side effect of climate change in the Arctic is that the dividing line between 'Arctic' and 'non-Arctic' actors has become blurred and open to political interpretation, both as a result of more non-Arctic states developing Arctic agendas, as well as potential global power shifts, which may see challenges to the current Western-led international order.

Thus, when examining the overlap between climate change and security in the Arctic and the risks presented, there are several different levels of analysis which must be given full vetting. It is important, firstly, to avoid taking on a state-centric approach to understanding this connection, given that many threats to security in the Arctic exist on the individual or local level, and it is important to distinguish who exactly is being placed under threat by regional environmental conditions. In addition, the Arctic is not a blank space at the top of the globe, disconnected from other global issues of environmental concern. Finally, it is necessary to acknowledge that even with the 'return' of hard-power security thinking in the Arctic, (assuming it ever truly left), the risks and threats from climate change which affect far northern populations have not gone away. Addressing insecurities in the Arctic, in their many forms, cannot be addressed separately from climate change, nor should it.

[22] Guarino, M.-V. et al., 'Sea-ice-free Arctic during the Last Interglacial supports fast future loss', *Nature Climate Change*, vol. 10 (10 Aug. 2020), pp. 928–32.

[23] Bennett, M. M. et al., 'The opening of the Transpolar Sea Route: Logistical, geopolitical, environmental, and socioeconomic impacts', *Marine Policy*, vol. 121 (2020).

[24] Lanteigne, M., 'Inside, outside, upside down? Non-Arctic states in emerging Arctic security discourses', eds K. Spohr, D. S. Hamilton and J. Moyer, *The Arctic and World Order* (Brookings Institution Press: Washington, DC, 2020), pp. 379–404.

2. Climate Change and Migration: A Case Study of Guatemala

Farah Hegazi with Joshua W. Busby

Introduction

Since 1990, estimates of the number of migrants from Central America's Northern Triangle (El Salvador, Guatemala and Honduras) to the United States have consistently increased (see figure 2.1).[1] Although there are numerous possible contributors to migration decisions, including poverty, limited access to services, and social exclusion and persecution, climate change has become increasingly understood as a potential driver of contemporary migration. Within Central America, analysts have documented the role of deteriorating agricultural conditions and their impact on the livelihoods of local communities as one of many reasons for increases in migration to the United States.[2]

The attitudes and measures of the recipient country influence how migrants are received. Under the Trump Administration, migration was approached as a security risk and the administration reacted by militarizing the border.[3] Comparatively, the Biden Administration initially de-securitized the narrative, focusing instead on addressing the root causes of migration, but has since re-engaged in stronger border enforcement after legal challenges, demonstrating the complexities involved in addressing migration.[4]

Given the complexity of the relationship between migration, environmental change, and security, this case study, using the example of Guatemala, will focus on addressing two key questions: (*a*) what role, if any, does climate change play in the migration decisions of migrants? And (*b*) does climate induced migration lead to conflict or other security outcomes? The goal is to understand the emergent risk of climate-induced migration and the varied responses to that risk.

Climate change, migration and conflict

Although the practice of migration has long existed, research on the relationship between climate change and migration gained momentum in the 1980s.[5] The theory framing this relationship is that environmental change can be a push factor that drives people to move, primarily within a country's borders, because it no longer becomes possible to live in a place.[6] This relationship, however, is not linear, as decisions to migrate are not solely based on the adverse environmental impacts that people are experiencing. Multiple factors—environmental, social, economic, political, demographic and cultural—play a role. Within Central America, projections estimate

[1] United Nations Department of Economic and Social Affairs, Population Division, 'International Migrant Stock 2020', accessed 9 Dec. 2021.

[2] Sigelman, L., *The Hidden Driver: Climate Change and Migration in Central America's Northern Triangle* (American Security Project: Washington, DC, Sep. 2019)

[3] Sigelman (note 2).

[4] Pamuk, H., 'Blinken urges Central America to help on migrants, flags democracy concerns', Reuters, 2 June 2021.

[5] Piguet, E., Kaenzig, R. and Guélat, J., 'The uneven geography of research on "environmental migration"', *Population and Environment*, vol. 39 (2018).

[6] Andersen, L., Lund, L. and Verner, D., 'Migration and climate change', ed. D. Verner, *Reducing Poverty, Protecting Livelihoods, and Building Assets in a Changing Climate: Social Implications of Climate Change in Latin America and the Caribbean, Direction in Development: Environment and Sustainable Development* (World Bank: Washington, DC, 25 June 2010), pp. 201–202; Milan, A. and Ruano, S., 'Rainfall variability, food insecurity and migration in Cabricán, Guatemala', *Climate and Development*, vol. 6, no. 1 (2 Jan. 2014); and Burrows, K. and Kinney, P., 'Exploring the climate change, migration and conflict nexus', *International Journal of Environmental Research and Public Health*, vol. 13, no. 4 (2016).

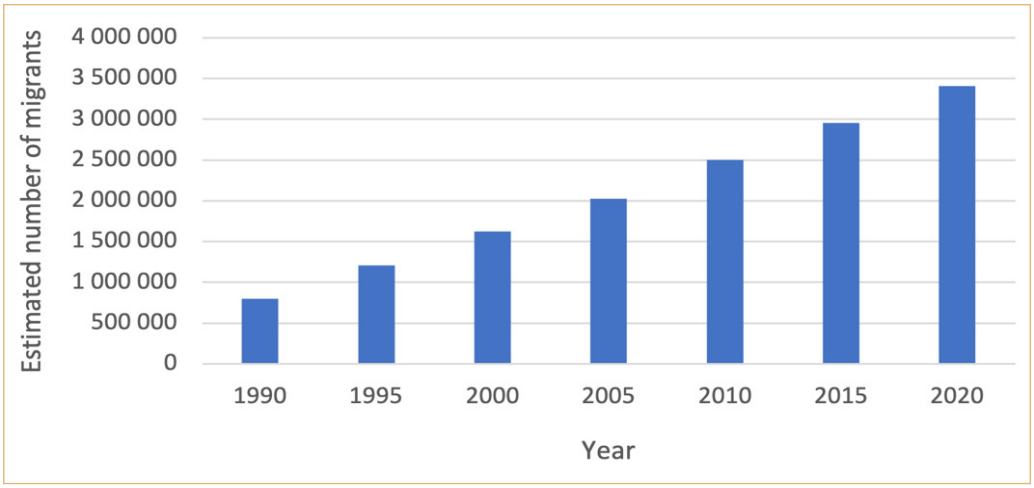

Figure 2.1. Estimated number of migrants to the United States from Central America's Northern Triangle

Source: United Nations Department of Economic and Social Affairs, Population Division, 'International Migrant Stock 2020', accessed 9 Dec. 2021.

that between 2.2 million and 17.1 million people could migrate internally by 2050, and 30 million externally to the US.[7],[8]

Similarly, the relationship between migration and conflict is also not linear. Research has indicated that internal and cross-border migrants have the potential to contribute to conflict or prolong existing conflicts in their host communities.[9] Where conflict has arisen, it has generally been associated with fragile institutions, socioeconomic problems and larger displacement waves, or a fast-onset influx of migrants.[10]

There are, however, distinctions between environmental migrants and refugees with regards to the dynamics of violence.[11] Broadly, migration driven by environmental reasons will tend to occur gradually, which will allow host communities to adjust.[12] Slow processes such as desertification and sea level rise are unlikely to lead to migration surges within a short time period; because of this, host communities are able to acclimate.[13] In addition, as environmental migrants rarely have a political agenda, there is a lower likelihood of introducing conflict to their host communities.[14]

Climate change and migration in Guatemala

Central America is projected to be a primary hotspot for climate change in tropical regions, and with agriculture being an important source of income, climate-induced precipitation changes are predicted to be highly problematic for the region.[15] Second to poverty and unemployment, food insecurity and increases in population density and growth are expected to spur migration from Central America.[16],[17] High crime rates and violence in Guatemala, from gangs and trafficking,

[7] Clement, V. et al., *Groundswell Part 2: Acting on Internal Climate Migration* (World Bank: Washington, DC, 2021).

[8] Watkins, G., and Garcia Salinas, A., 'The Climate Crisis could drive massive human displacement in Latin America and the Caribbean', Inter-American Development Bank, accessed 9 Dec. 2021.

[9] Ghimire, R., Ferreira, S. and Dorfman, J. H., 'Flood-induced displacement and civil conflict', *World Development*, vol. 66 (2015); and Gleditsch, N. P., Nordås, R. and Salehyan, I., *Climate Change and Conflict: The Migration Link*, Working Paper (International Peace Institute: New York, May 2007), p. 5.

[10] Gleditsch, Nordås and Salehyan (note 9); Ghimire, Ferreira and Dorfman (note 9).

[11] Gleditsch, Nordås and Salehyan (note 9).

[12] Gleditsch, Nordås and Salehyan (note 9); Reuveny, R., 'Climate change-induced migration and violent conflict', *Political Geography*, vol. 26, no. 6 (Aug. 2007).

[13] Gleditsch, Nordås and Salehyan (note 9).

[14] Gleditsch, Nordås and Salehyan (note 9).

[15] de Sherbinin, A., 'Climate change hotspots mapping: What have we learned?', *Climatic Change*, vol. 123, no. 1 (Mar. 2014).

[16] IADB et al., *Food Security and Emigration: Why People Flee and the Impact on Famliy Members Left behind in El Salvador, Guatmala and Honduras* (WFP: Aug. 2017), p. 16.

[17] de Sherbinin (note 15).

combined with corruption and ineffective state institutions further add to the difficulties in addressing these challenges.[18]

Despite having a stable macroeconomic environment, Guatemala has been unsuccessful in evenly distributing the benefits of economic development.[19] Forty-nine per cent of the country's population lives below the poverty line and is highly vulnerable to the predicted effects of climate change.[20],[21] Inequality, stemming from colonial policies, is high.[22] Elites own a majority of the country's land, and climate adaptation programmes, legal reforms and social programmes have not been prioritized.[23]

Although agriculture constitutes a small portion of Guatemala's economy (10 per cent of GDP),[24] 48 per cent of Guatemala's population lives in rural areas, with 42 per cent of men and 10 per cent of women reliant on the agricultural sector for an income.[25],[26] Instability in the sector could therefore have devastating effects on the most vulnerable sections of society. During 2011–2012, for example, production costs for coffee almost doubled compared with ten years prior.[27] Paradoxically, the price of coffee has decreased on the global market. These two factors have reduced the financial return of coffee farming for smallholder farmers and decreased the demand for coffee farm workers.[28] In 2012 and 2014, a coffee rust outbreak occurred, which among other factors, was associated with changes in temperature and resulted in grave implications for the livelihoods and food security of coffee farmers and workers, as the disease destroyed crops.[29] The decrease in coffee production then resulted in a wage decrease of between 13 per cent and 27 per cent.[30]

In addition to cash crops, staple rain-fed crops like maize and beans constitute another source of food provision for poor households. However, subsistence farmers in Guatemala indicate that they have experienced changes in rainfall, including a shorter rainy season, a reduction in the frequency of rainfall, an increase in the intensity of rainfall, and more extended dry periods.[31] These changes have negatively affected households' food production and food availability, placing households' food security at risk.[32]

The US response to climate-related trans-border migration

Prompted by the impacts of climate change on livelihoods and food security and by the lack of a response from the Guatemalan government to address the consequences, Guatemalans have sought to move to the US. Guatemalan nationals currently contribute the largest number of migrants apprehended at the US border, accounting for about 31 per cent of total apprehensions.[33]

The US response to the large number of migrants arriving at the US border has both been securitized and de-securitized. Historically, the US government's strategy has combined both

[18] Sigelman (note 2).
[19] Sigelman (note 2).
[20] World Bank, 'The World Bank in Guatemala', Overview, 31 May 2021.
[21] ECLAC and FAO, *Atlas of Migration in Northern Central America* (United Nations: 2018), p. 13.
[22] InSight Crime, 'Guatemala profile', InSight Crime, 28 Feb. 2021.
[23] Sigelman (note 2), p. 6.
[24] World Bank, 'The World Bank: Data, Agriculture, forestry, and fishing, value added (% of GDP)', accessed 15 July 2021.
[25] World Bank, 'The World Bank: Data, Rural population (% of total population)', accessed 15 July 2021.
[26] World Bank, 'The World Bank: data, Employment in agriculture, female (% of female employment) (modelled ILO estimate)', accessed 15 July 2021; and World Bank, 'The World Bank: Data, Employment in agriculture, male (% of male employment) (modelled ILO estimate)', accessed 15 July 2021.
[27] Avelino, J. et al., 'The coffee rust crises in Colombia and Central America (2008–2013): Impacts, plausible causes and proposed solutions', *Food Security*, vol. 7, no. 2 (Apr. 2015).
[28] Pons, D., 'Climate extremes, food insecurity, and migration in Central America: a complicated nexus', Migration Information Source, Migration Policy Institute, 18 Feb. 2021.
[29] Avelino et al. (note 27); and Schoonover, R., Cavallo, C. and Caltabiano, I., *The Security Threat That Binds Us* (Council on Strategic Risks: Converging Risks Lab, 27 Jan. 2021), p.48.
[30] Avelino et al. (note 27).
[31] Warner, K. et al., *Where the Rain Falls: Climate Change, Food and Livelihood Security, and Migration. An 8-Country Study to Understand Rainfall, Food Security and Human Mobility* (United Nations University Institute for Environment and Human Security: Nov. 2012), p. 83.
[32] Milan and Ruano (note 6); and Warner et al. (note 31).
[33] Total apprehensions by US Customs and Border Protection in FY2019 amounted to 859 501. Of those, 265 129 held Guatemalan citizenship. Comparatively, those holding Mexican citizenship amounted to 169 536 (US Customs and Border Patrol). US Customs and Border Protection defines apprehensions as 'the physical control or temporary detainment of a person who is not lawfully in the USA, which may or may not result in an arrest'. US Customs and Border Protection, 'CBP enforcement statistics fiscal year 2023', accessed 15 July 2021. See also US Customs and Border Patrol, 'US Border Patrol nationwide apprehensions by citizenship and sector (FY2007–FY2019)', accessed 15 July 2021.

approaches. Development assistance was provided to improve the resilience of Central American governments and the countries' economies.[34] In addition, the US Government provided funds for 'security assistance to help law enforcement, counter-narcotics, and justice reform' in the Northern Triangle.[35]

In 2018, however, the response shifted towards being increasingly securitized, as the Trump Administration installed US troops at the US border with Mexico.[36] In addition, rather than continue providing development assistance, the Trump Administration agreed with the Guatemalan government to reduce migrant flows via law enforcement.[37] This securitized response is consistent with scholars predicting that wealthier states with tight border control have a higher probability of adopting severe responses to immigrants.[38]

In contrast, the Biden Administration initially de-securitized its response and instead took the approach of addressing the root causes of migration to reduce migrant flows from Central America to the US.[39] The administration's 4-year, $4 billion plan includes providing development assistance to Central American countries to address 'corruption and the lack of economic opportunities', improving local governance, increasing emergency food assistance, and providing 'income support programmes'.[40]

The push to address the root causes, however, has been overshadowed by 'concern about graft, cronyism, signs of authoritarianism and efforts to block the appointment of judges with track records of tackling corruption'.[41] Earlier efforts to address corruption in Guatemala received criticism from government officials themselves,[42] and a UN-backed investigation on corruption by the Commission against Impunity found that 25 per cent of political funding derives from organized crime (primarily drug trafficking)[43] and that politics at the local level is more susceptible to being funded by those same sources.[44]

Although the root causes plan is still in place despite the aforementioned concerns, the Biden Administration has been re-engaging in border protection more strongly along the US–Mexico border. The Administration, for example, has been forced by court order to re-instate the Migrant Protection Protocol, also known as the 'Remain in Mexico' programme, established during the Trump Administration, which requires those seeking asylum in the US to remain outside the US while their cases move through the American legal system.[45]

Lessons learned

Although the evidence on climate-related migration is weak, it is clear that the effects of climate change have adverse impacts on agriculture-dependent livelihoods. The lack of livelihood opportunities and economic circumstances are a push factor for migration more broadly, and migration can increase the likelihood of conflict.

Limiting transnational migration will therefore require addressing the drivers and root causes of migration. In rural communities dependent on agriculture, climate adaptation and mitigation programmes will be essential to people maintaining their agricultural livelihoods. These programmes will, however, need to be implemented at scale and in a manner that is conflict-sensitive, equitable and just. Efforts should not only e made to climate-proof the agricultural sector but also to develop local businesses,[46] as agriculture is not the only source of employment.

[34] Sigelman (note 2), p. 9.
[35] Sigelman (note 2), p. 9.
[36] Sigelman (note 2).
[37] Soboroff, J. and Ainsley, J., 'Trump admin ignored evidence of climate change's impact on migration', NBC News, NBC News, 21 Sep. 2019.
[38] Gleditsch, Nordås and Salehyan (note 9).
[39] Meyer, P. J., *Central American Migration: Root Causes and US Policy*, IF11151 (Congressional Research Service (CRS), US Congress: Washington, DC, 22 Apr. 2021), p. 2.
[40] 'Kamala Harris tells Guatemala migrants: "Do not come to US"', BBC News, 8 June 2021; Pamuk (note 4); and Meyer (note 39).
[41] Pamuk (note 4).
[42] Lakhani, N., 'Guatemala elections show corruption rampant four years after uprising toppled president', *The Guardian*, 13 June 2019.
[43] International Commission against Impunity in Guatemala, *Financiamiento de la política en Guatemala* [Financing of politics in Guatemala] (International Commission against Impunity in Guatemala: Guatemala de la Asuncion, July 2015), p. 43.
[44] Comisión Internacional contra la Impunidad en Guatemala (note 44).
[45] Miroff, N. and Sullivan, S., 'Biden's border woes expose White House divisions as centrists assert more control', *Washington Post*, 8 Nov. 2021; and McCammon, S., Macias, M. and Kenin, J., '"Remain in Mexico", the Trump era policy that haunts the Biden administration', NPR, 22 Oct. 2021.
[46] Sigelman (note 2).

Furthermore, development assistance must value migrants' communities of origin and learn how to best invest in sustainable local options.[47] Concerted efforts, however, will require participation from the state to establish a macro-setting that is conducive to helping people. Put simply, this means rooting out corruption in all its forms to ensure that the fiscal resources required to implement adaptation programmes fully reach those for whom they are intended.

[47] Sigelman (note 2).

3. Environmental Defenders

Jose Alvarado

Introduction

Activism, about the climate crisis, has risen dramatically over the last few years, particularly among traditionally marginalized and disproportionally affected groups, such as women, youth, and indigenous peoples and local communities (IPLCs). Although the increase in activism has pushed the climate movement to the top of governments' agendas and increased general awareness of the severity of the issues among the public, the presence of these activists has also resulted in a rise in violence and conflict, for both themselves and those they are attempting to protect.

Since 2012, Global Witness has been gathering data on killings of land and environmental defenders. Evidence suggests that as the climate crisis intensifies, violence against those protecting their land, and the planet as a whole, increases. The year 2020 was found to be the deadliest year to date for environmental defenders, with 227 recorded deaths.[1] Frontline Defenders, through their research, found that in 2020, environmental defenders accounted for an estimated 69 per cent of all human rights defenders killed in that period.[2]

Almost three-quarters of the attacks took place in the Americas—with 7 out of the 10 highest countries located in Latin America. In Brazil and Peru, nearly three quarters of recorded attacks took place in the Amazon region of each country. Colombia had the highest recorded attacks, with 65 defenders killed in 2020, and a third of these attacks targeted indigenous and afro-descendant people, with almost half made against small-scale farmers. Nicaragua became the most dangerous country per capita for land and environmental defenders in 2020, due to an increase from 5 killings in 2019 to 12.[3]

In regard to gender, men were found to be overrepresented as victims of murder (90 per cent), with women representing the remaining 10 per cent. It should be noted, however, that although women account for a much smaller percentage of overall environmental defender killings in 2020, due to gender norms, they tend to experience violence and discrimination in a very different way to men, for example, through reduced access to support, and alienation within their communities. Highlighting the damaging effects of not only violent conflict, but also non-violent interactions.

Natural resources, and their extraction for commercial purposes, have been found to be the main drivers of violence and death, amongst environmental defenders. In 2020, the logging, water and dams, and Mining and Extractives sectors resulted in 60 deaths. In fragile contexts with weak rule of law, for example, the intersection of supply and demand over these resources, dysfunctional resource management, and a history of conflict and marginalization of populations have been noted to be the leading causes of instability, and in turn, conflict.[4]

In areas which are already experiencing a history of natural resource conflicts in addition to the negative impacts of climate change, the killing of defenders is facilitated by a series of factors.[5] These are generally associated with patterns of impunity for perpetrators, the lack of an independent and effective judiciary and media reporting, collusion between unaccountable networks of political, economic and military elites (including corruption), social 'habituation' to homicides on the part of authorities, and state tolerated/encouraged vigilante activity.[6]

The killings have been found to be carried out through a variety of means, with hitmen being the most commonly used method. The highly publicized case of DESA (Desarrollos Energéticos),

[1] Global Witness, *Defending Tomorrow: The Climate Crisis and Threats against Land and Environmental Defenders* (Global Witness: July 2020), p. 8.

[2] Front Line Defenders, *Front Line Defenders Global Analysis 2020* (Front Line Defenders: Dublin, Feb. 9, 2021), p. 4.

[3] Global Witness, 'Global Witness reports 227 land and environmental activists murdered in a single year, the worst figure on record', accessed 14 Dec. 2021.

[4] Rüttinger, L. et al., *A New Climate for Peace: Taking Action on Climate and Fragility Risks* (Adelphi; International Alert; Woodrow Wilson International Center for Scholars; European Union Institute for Security Studies: Berlin, 2015), p. 16.

[5] United Nations, General Assembly, Situation of human rights defenders, Note by the Secretary-General, A/71/281, 3 Aug. 2016, p. 4.

[6] Larsen, P. B. et al., 'Understanding and responding to the environmental human rights defenders crisis: The case for conservation action', *Conservation Letters*, vol. 14, no. 3 (May/June 2021), p. 3.

a hydropower and dam projects company, which illegally seized indigenous Lenca territory in Honduras to further advance a hydroelectric plant, and the murder of indigenous activist, Berta Cáceres, provides an example of the extreme lengths taken to silence the voice of activists and other opposition groups.[7] Other perpetrators include, militia, the armed forces and police.

However, it is important to remember that murder only represents a small section of violence and intimidation inflicted on environmental defenders. Violence directed at environmental defenders can be placed in several categories: direct, cultural or structural.[8] Lower visibility forms of repression, such as digital surveillance and limiting activists' access to information, are more commonly overlooked, but they are just as important to address in order to ensure that environmental defenders are able to peacefully be heard and acknowledged.

The example of Brazil

Under the Bolsonaro government, Brazil has undergone a series of accelerated changes promoting economic growth while decreasing protection for biomes such as the Amazon rainforest, the Atlantic Forest, and the Cerrado.[9] This has resulted in an increase of production of commodities such as minerals, soybeans and beef on illegally logged land, particularly in the protected Amazon rainforest.[10]

The effects of deregulation and unfettered growth are mostly felt by indigenous populations and their territories in the Amazon basin, who are frequently left out of conversations with elite groups linked to agriculture and extractive sectors. In the 1980s, Chico Mendes, a prominent historical activist, fought the exclusion of indigenous peoples in such decision processes,[11] and his efforts led to the creation of Brazil's 1988 constitution, guaranteeing indigenous rights on ancestral lands. However, in reality, onerous bureaucratic processes have delayed recognition of indigenous areas totalling approximately 98 000 square kilometers.[12]

The current government's low regard for indigenous rights has resulted in a drop in fines for environmental crimes, as well as a drop in enforcement for crimes against the environment and against indigenous defenders.[13] In 2019, the Amazon region alone saw 33 deaths and accounted for almost 90 per cent of all killings in the country.[14] Global Witness has also noted that Amazon deforestation has been particularly dire for indigenous populations. In Maranhão state for example, between 2000 and 2018, 42 Guajajara indigenous people have been murdered in the ongoing conflict with illegal loggers.[15] In response, Indigenous leaders in Brazil and human rights groups have submitted a request for an examination to the International Criminal Court (ICC) to investigate the president over his policies which they say encourage indigenous genocide.[16]

What has been done?

Preventing the killing of environmental defenders requires national and international protection mechanisms.[17] Defenders are entitled to the rights set out in the UN Declaration on Human Rights Defenders, adopted by the UN General Assembly in 1998. Those rights include:

1. The right to promote and to strive for the protection of human rights (the right to defend rights).
2. The right to be protected.
3. The right to freedom of opinion and expression, and to develop and discuss new human rights ideas.

[7] Tábora, E., 'Los asesinos de Berta Cáceres al descubierto' [The murderers of Berta Cáceres exposed], *El Faro*, 22 Apr. 2021.
[8] Butt, N. et al., 'The supply chain of violence', *Nature Sustainability*, vol. 2, no. 8 (Aug. 2019), p. 743.
[9] Thomaz, S. M. et al., 'Opinion: the future of nature conservation in Brazil', *Inland Waters*, vol. 10, no. 2 (2 Apr. 2020).
[10] 'Deathwatch for the Amazon', *The Economist*, 3 Aug. 2019.
[11] Ramalho, T., 'Chico Mendes: Brazilian labour leader and conservationist', Encyclopedia Britannica, accessed 30 May 2021.
[12] Torres, M. and Branford, S., 'Brazil opens 38 000 square miles of indigenous lands to outsiders', Mongabay, accessed 30 May 2021.
[13] Torres and Branford (note 12).
[14] Global Witness (note 1).
[15] Global Witness (note 1).
[16] Milhorance, F., 'Jair Bolsonaro could face charges in The Hague over Amazon rainforest', *The Guardian*, accessed 30 May 2021.
[17] See Butt et al. (note 8); and United Nations Environment Programme (UNEP), *Environmental Rule of Law: First Global Report* (UNEP: Nairobi, 2019).

4. The right to access and communicate with international bodies, and the right to access funding.
5. The right to freedom of assembly, the right to freedom of association, and the right to protest.
6. The right to an effective remedy.[18]

While all of these rights are interrelated, actions to protect defenders at the international and regional levels have commonly focused on substantive rights, which include land rights, indigenous rights and other rights such as the right to a clean and healthy environment. The right to freedom of opinion, the right to access and communicate with international bodies, and the right to freedom of assembly are considered procedural rights. These rights focus mainly on community action and participation in decision-making concerning community rights and resources.[19]

International

In March 2019 the United Nations Human Rights Council adopted resolution, 40/11, focusing on the protection of environmental human rights defenders.[20] Among other things, the resolution acknowledges the high levels of risk defenders face, ensuring that effective remedies are made available to them for human rights violations and combating impunity. It also recognizes the responsibility of transnational corporations and in doing so urges states to implement the Guiding Principles of Business and Human Rights.[21]

The Guiding Principles, unanimously passed by the UN Human Rights Council (UNHRC) in 2011, underscore the risk posed by transnational corporate interests and why both businesses and states should provide effective and accessible grievance mechanisms for individuals and communities affected by business enterprises using judicial and non-judicial mechanisms at the regional, national and local levels.[22] UNEP has highlighted for example that more than 80 per cent of 58 resource-rich countries do not have satisfactory governance in their extractive sectors.[23] This is particularly worrying in countries such as Peru, Liberia and Indonesia where 30–40 per cent of the land has been leased to private entities for exploitation.[24]

Regional

Currently at the regional level, the most important instrument including specific provisions for the protection and promotion of environmental human rights defenders is the Regional Agreement on Access to Information, Public Participation and Justice in Environmental Matters in Latin America and the Caribbean, also known as the Escazú Agreement. As the region's first environmental treaty, as well as the world's first agreement with provisions on human rights defenders in environmental matters, it is a highly important document for regions experiencing high risk for advocates and activists.[25] Adopted in 2018, the Escazú Agreement is a binding document, and as such state parties who have ratified the agreement must allow public participation in environmental decision-making and must provide measures to protect environmental activists.[26] As of now, 12 countries have ratified the agreement but some of the

[18] Knox, J. H., *Environmental Human Rights Defenders: A Global Crisis*, Policy Brief (Universal Rights Group: Feb. 2017), p. 16.
[19] UNEP (note 17).
[20] United Nations, General Assembly, 'Recognizing the contribution of environmental human rights defenders to the enjoyment of human rights, environmental protection and sustainable development', Resolution adopted by the Human Rights Council, A/HRC/RES/40/11, 19 Apr. 2019.
[21] 'UN resolution recognizes environmental defenders', ESCR-Net, accessed 6 May 2021.
[22] United Nations, General Assembly, 'Promotion and protection of all human rights, civil, political, economic, social and cultural rights, including the right to development', A/HRC/40/L.22/Rev.1, 20 Mar. 2019, p. 6.
[23] UNEP (note 17).
[24] Kimbrough, L., Mongabay, 'Developing land without approval of local people "a human rights issue of grave concern," says new report', Rights and Resources, accessed 30 Nov. 2021.
[25] International Institute for Sustainable Development (IISD), 'Escazu Agreement takes effect, enshrining right to sustainable development', accessed 14 Dec. 2021.
[26] Glatsky, G., 'For Latin America's environmental defenders, Escazú Agreement is a voice and a shield', Mongabay, accessed 8 May 2021.

deadliest countries in the world for defenders, Peru, Guatemala, Brazil, Colombia, and Honduras, have either not ratified or signed it.[27]

Another regional proposal that is currently gaining traction is a proposal to create a rapid response mechanism to provide protection for environmental human rights defenders under the framework of the Aarhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters.[28] There are currently 47 parties to the Convention, including the European Union.[29] An independent Rapporteur on environmental defenders who would provide a rapid response to alleged violations by issuing immediate protection measures against persecution, penalization and harassment of defenders is also being discussed.[30] This measure will be brought up during the Twenty-fifth meeting of the Working Group of the Parties to the Aarhus Convention on 7 and 8 June 2021.

National

At the national level, clear frameworks, typically dealing with rights to land and within conflict-prone sectors such as mining, can prevent assassinations and physical violence against defenders. Research has found that 47 per cent of all mobilizations against damaging environmental activities involve farmers, underlining the need for land tenure rights.[31]

A study from 2011 also noted that over 90 countries had adopted framework laws or regulations for access to information and 80 have the right to information enshrined in their constitutions.[32] Over 120 countries have also adopted legal provisions on environmental impact assessments (EIA), which require assessing environmental and social impacts of projects prior to their approval.

Along with procedural rights, more active measures to protect defenders by ensuring their physical safety include whistleblower laws and protection for journalists. As of 2019, a total of 59 countries have enacted whistleblower protections, and these laws have been found to be the strongest when they are confidential, they are linked to financial awards, or if whistleblower claims are handled by independent government agencies or through intermediaries, such as NGOs.[33]

Lessons learned

Various recommendations have been made by organizations, such as Global Witness, to end violence against environmental defenders at the international, regional, and national levels. One of the most important recommendations includes greater commitments from states to align the 2015 Paris Agreement with international human rights obligations and standards applicable to business operations, defenders, and indigenous and other communities at the upcoming 2021 United Nations Climate Change Conference (COP26).[34] The recent adoption (October 2021) of the a watershed resolution (48/13), by the UN Human Rights Council, recognizing a healthy environment as a fundamental human right, is a step in the right direction.

Yet, as noted by networks such as the Global Campaign to Dismantle Corporate Power, corporate impunity and corporate and political interests continue hampering efforts to protect defenders. While the onus should be on states and transnational corporations to prevent human rights abuses and environmental destruction, concrete protection mechanisms are the most effective way of protecting environmental defenders and the communities they speak up for.[35]

[27] Glatsky (note 26).
[28] Larsen et al. (note 6).
[29] United Nations, Economic Commission for Europe (UNECE), 'Map of parties Aarhus Convention', accessed 9 May 2021.
[30] UNECE, Economic and Social Council, 'Draft note on a rapid response mechanism to deal with cases related to Article 3(8) of the Aarhus Convention', ECE/MP.PP/WG.1/2021/12, 16 Mar. 2021, pp. 8–9.
[31] Scheidel, A. et al., 'Environmental conflicts and defenders: a global overview', *Global Environmental Change*, vol. 63, no. 102104 (July 2020).
[32] Banisar, D. et al., *Moving from Principles to Rights: Rio 2012 and Access to Information, Public Participation, and Justice*, SSRN Scholarly Paper ID 2164685 (Social Science Research Network: Rochester, NY, 20 Oct. 2012), p. 10.
[33] Kohn, S. M. and Kostyack, J., 'Whistleblower protection: An essential tool for addressing corruption that threatens the world's forests, fisheries and wildlife', *Targeting Natural Resource Corruption*, Topic Brief (Feb. 2021).
[34] Global Witness (note 1).
[35] Scheidel et al. (note 31).

4. Gender in Contexts of Climate and Insecurity

Elizabeth Smith and Karolina Eklöw

Introduction

The systemic, networked, cascading and compounding effects of climate change and environmental crises can contribute to various peace and security risks in direct and indirect ways. In some contexts, these effects can contribute to increasing the risk of violent conflict.[1] Gender is important to consider in efforts to prevent or mitigate these risks. Dynamics related to climate change, peace and insecurity are not gender-neutral and will affect different women, men, girls and boys in varying ways.[2] Gender shapes power relations between and within different groups, and gendered norms and inequalities can influence access to resources, mobility, and formal roles in public spaces. Gender can influence who is affected by violence and in what ways.[3] It can intersect with other identity markers, including ethnicity, age, disability and class to further compound or heighten risks related to climate change and insecurity.[4]

Efforts to address security risks related to climate change and environmental degradation need to consider both the specific risks faced by different genders, as well as the equal and meaningful participation of all affected demographics in preventing and addressing these risks.[5] Women and girls are often excluded from formal decision-making surrounding climate change and insecurity in many contexts, but their equal participation and leadership in addressing these issues is crucial. This is not only important for their own human rights and security, but also their participation will benefit greater community well-being and human security.[6] Broadly, gender inclusion correlates with higher quality and more sustainable peace.[7] Further, in certain contexts, women and girls' localized and unique knowledge of natural resources can improve household and community adaptation to climate change.[8] This paper provides examples in which climate change and environmental crises influence the security contexts in Lake Chad, Mali and Somalia, and how gender can shape how different individuals are affected by and respond to these dynamics.

Contexts of climate change and insecurity

Research has highlighted how the impacts of climate change and environmental crises can indirectly affect insecurity and conflict in different contexts.[9] Lake Chad, Somalia and Mali are

[1] Mobjörk, M. et al., *Climate-Related Security Risks: Towards an Integrated Approach* (Stockholm International Peace Research Institute: Stockholm, Oct. 2016).

[2] Committee on the Elimination of Discrimination and against Women (CEDAW), *General Recommendation No. 37 on Gender-Related Dimensions of Disaster Risk Reduction in the Context of Climate Change*, CEDAW/C/GC/37 (CEDAW: 7 Feb. 2018).

[3] Coomaraswamy, R. et al., *Preventing Conflict, Transforming Justice, Securing the Peace: A Global Study on the Implementation of United Nations Security Council Resoluton 1325* (United Nations Women: 2015).

[4] CEDAW (note 2).

[5] Smith, E. S., *Climate Change in Women, Peace and Security National Action Plans*, 2020/7 (Stockholm International Peace Research Institute: Stockholm, June 2020).

[6] Smith (note 5).

[7] World Bank and United Nations, *Pathways for Peace: Inclusive Approaches to Preventing Violent Conflict* (World Bank Group: Washington, DC, 2018).

[8] Tanyag, M. and True, J., 'Gender responsive alternatives on climate change from a feminist standpoint', *Climate Hazards, Disasters, and Gender Ramifications* (Routledge: London, 2019).

[9] Eklöw, K. and Krampe, F., *Climate-Related Security Risks and Peacebuilding in Somalia*, SIPRI Policy Paper no. 53 (Stockholm International Peace Research Institute: Stockholm, Oct. 2019); Hegazi, F., Krampe, F. and Smith, E. S., *Climate-Related Security Risks and Peacebuilding in Mali*, SIPRI Policy Paper no. 60 (Stockholm International Peace Research Institute: Stockholm, Apr. 2021); von Uexkull, N. et al., 'Civil conflict sensitivity to growing-season drought', *Proceedings of the National Academy of Sciences*, vol. 113, no. 44 (1 Nov. 2016); Busby, J., *The Field of Climate and Security: A Scan of the Literature* (Social Science Research Council: Apr. 2019); Mobjörk, M., Krampe, F. and Tarif, K.,

discussed here as three examples of settings in which climate change and environmental crises affect insecurity in indirect ways, notably through livelihood deterioration and migration.

Lake Chad is the site of a complex humanitarian crisis, influenced by regional insecurity, environmental deterioration, and development issues.[10] The Lake is the largest source of freshwater in the Sahel and is a crucial resource and source of livelihood for 30 million people in its four riparian countries—Chad, Cameroon, Niger and Nigeria.[11] However, depletion of the lake's resources due to climate change and environmental degradation has indirectly contributed to instability and violence in the Lake Chad basin.[12] Between 1960 and 2005, the lake significantly decreased in size.[13] Reduced rainfall levels, severe droughts in the 1970s and 1980s, and unsustainable irrigation projects and water exploitation led to decreased water levels.[14] Continuously increasing populations of humans and livestock in the area put further pressure the resource.[15] The degradation of the lake has led to further forms of environmental degradation in the basin, including biodiversity loss, desertification, and water body sedimentation.[16]

The instability in the Sahel region, aggravated by the presence of extremist groups, extends throughout the Lake Chad Basin.[17] The shrinking of the lake and the degradation of its resources exacerbates this insecurity. The loss of natural resource-dependent livelihoods and lack of alternative options can push people into criminal activities and provide recruitment opportunities for extremist groups.[18] Extremist groups also escalate conflicts between farmers and pastoralists.[19] The severe and sometimes abusive actions of national militaries in their attempts to combat armed groups have also contributed to both the destruction of livelihoods and state-society relations, which in turn contributes to people engaging with armed groups.[20]

Somalia has experienced conflict since the late 1980s. Local level conflicts, influenced by resource access and clan affiliation, intersect with national level conflict influenced by territorial interests, governmental control, and politicized clan identities. Climate change and environmental degradation further shape conflict dynamics and security risks.[21] In Somali society, founded on the norms of nomadic life, agriculture and clan belonging, climate change has direct effects on the very core institutions of life.[22] Precipitation data since the start of the 20th century notes alternating periods of wet and dry years, with an uptick in extreme flood and drought events between 1962 and 2005.[23] Since the 1960s, mean annual temperatures have gradually and steadily increased.[24] Dry periods have become both more protracted and frequent, impacting people's ability to support themselves, as half of the population is dependent on income from livestock farming.[25] In recent decades, severe weather events have led to famines and displacement.[26] Drought and the ensuing famine in 2011 contributed to an estimated loss of life for hundreds of thousands of citizens.[27] Drought in 2016 and 2017 threatened famine again in parts of the country,

Pathways of Climate Insecurity: Guidance for Policymakers (Stockholm International Peace Research Institute: Stockholm, Nov. 2020); and Barnett, J. and Adger, W. N., 'Climate change, human security and violent conflict', *Political Geography*, vol. 26, no. 6 (2007).

[10] Owonikoko, S. B. and Momodu, J. A., 'Environmental degradation, livelihood, and the stability of Chad Basin Region', *Small Wars & Insurgencies*, vol. 31, no. 6 (17 Aug. 2020); Adelphi, 'Lake Chad risk assessment project', In Focus, [n.d.]; and Taub, B., 'Lake Chad: The world's most complex humanitarian disaster', *The New Yorker*, 27 Nov. 2017.

[11] Yunana, D. A. et al., 'Climate change and lake water resources in Sub-Saharan Africa: Case study of Lake Chad and Lake Victoria', *Nigerian Journal of Technology*, vol. 36, no. 2 (21 Apr. 2017); and Musa, Engr. I. K. et al., *Saving Lake Chad* (Lake Chad Basin Commission and International Commision on Irrigation and Drainage: 2008).

[12] Owonikoko and Momodu (note 10).

[13] Yunana et al. (note 11); Onuoha, F. C., 'Environmental degradation, livelihood and conflicts: A focus on the implications of the diminishing water resources of Lake Chad for North-Eastern Nigeria', *African Journal on Conflict Resolution*, vol. 8, no. 2 (20 Jan. 2009).

[14] Onuoha (note 13).

[15] Owonikoko and Momodu (note 10).

[16] Musa et al. (note 11). Interview: Hindou.

[17] Owonikoko and Momodu (note 10).

[18] Owonikoko and Momodu (note 10); Vivekananda, J. et al., *Shoring Up Stability: Addressing Climate and Fragility Risks in the Lake Chad Region* (Adelphi: Berlin, 19 May 2019); and United Nations Development Programme (UNDP), Regional Bureau for Africa, *Journey to Extremism in Africa: Drivers, Incentives and the Tipping Point for Recruitment* (UNDP: New York, 2017).

[19] Takwa, Z. S., 'Addressing the Climate Change Insecurity Challenge in Nigeria and the Lake Chad Basin', UNDP and Folke Bernadotte Academy, Issue Brief no. 22, 2020.

[20] Vivekananda, J. et al. (note 18).

[21] Eklöw and Krampe (note 9).

[22] Somali Ministry of National Resources (SMNR), *National Adaptation Programme of Action on Climate Change* (SMNR: Mogadishu, Apr. 2013).

[23] Eklöw and Krampe (note 9).

[24] Eklöw and Krampe (note 9).

[25] Somali Ministry of National Resources (note 22).

[26] United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA), *Humanitarian Bulletin, Somalia, 1–30 June 2019* (UNOCHA: New York, 30 June 2019).

[27] Eklöw and Krampe (note 9).

and displaced hundreds of thousands.[28] Many in the countryside have lost their livelihoods and migrated to the larger cities with improved prospects for earning an income. Physical risks as well as human rights violations are common, both when migrating and when upholding household responsibilities and engaging in livelihood activities.[29] Resource scarcity can increase tensions among different herder and farmer groups, and armed groups can exploit individuals who have been internally displaced by extreme weather and conflict.[30]

Mali has experienced a complex conflict, with its most recent phase triggered in 2012. Among the intertwined causes of the conflict is a history of socio-economic exclusion, competition and control over natural resources, exploited friction between ethnic groups, and a limited or corrupt state presence.[31] The most recent crisis was sparked by a rebellion begun by Tuareg groups in the north of the country. While the crisis began in the north, its effects have since spread to its central regions. The presence of extremist and armed groups has exacerbated the violence and insecurity.[32] Climate change and environmental degradation impacts livelihoods, and subsequently contributes to heightened grievances and marginalization in the context of Mali's conflict.[33] The majority of Malians depend on natural resources for their livelihoods, which includes agriculture, pastoralism and fishing. As livelihoods are closely intertwined with group identity, the compounding effects of climate impacts and conflict on livelihoods can also affect social structures.[34] Limited available arable land can contribute to and aggravate conflicts between and within livelihood groups, all who depend on natural resources. As conflict and climate pressures shift traditional migration routes of pastoralist communities, this can lead to competition with farming communities over scarce land. Competition over scarce arable land—limited by exclusionary policies and environmental factors—can also contribute to aggravating inter-group conflicts exploited by armed and extremist groups in the central region of Mali.[35]

Gendered impacts of climate change and related insecurity

In Lake Chad, Mali and Somalia, gender influences risks and responses for different individuals in the contexts described above, notably related to livelihood deterioration, migration or displacement, and subsequent exploitation by armed actors.

Gender can also influence how livelihood deterioration and displacement can contribute to increased susceptibility of different individuals to recruitment by armed groups. In Lake Chad, extremist groups can exploit the poverty and livelihood loss in the basin to recruit people into their ranks.[36] Gender can affect why men and women may join for various reasons. Men and boys may join these groups to gain status and an income needed to marry and act as head of household, which are all challenged due to limited traditional livelihood options.[37] Women and girls may join due to a promise of education, empowerment or to participate in expected social change. They may also elect to stay with or return to the groups in lieu of living in IDP camps, which can be associated with high-risk of SGBV and dependence on aid organizations.[38] In Somalia, boys and young men are mainly subject to the recruitment into insurgent groups like al-Shabab—or any of the more than 60 armed militia groups that operate in Somalia. They are often at increased risk of recruitment in IDP camps, which have grown in Somalia due to conflict and climate-related factors including flooding and droughts.[39] Livelihood pressures may also prompt young men and women to join for different reasons. al-Shabab offers young male recruits an income, increased

[28] United Nations High Commissioner for Refugees(UNHCR), *Somalia Situation 2017: Supplementary Appeal* (UNHCR: 2017).

[29] United Nations Assistance Mission in Somalia (UNSOM) and UN Office of the High Commissioner for Human Rights (OHCHR), *Protection of Civilians: Building the Foundation for Peace, Security and Human Rights in Somalia* (UNSOM, OHCHR: Dec. 2017).

[30] Eklöw and Krampe (note 9).

[31] Hegazi, Krampe and Smith (note 9).

[32] Hegazi, Krampe and Smith (note 9).

[33] Hummel, D., 'Climate change, land degradation and migration in Mali and Senegal: Some policy implications', *Migration and Development*, vol. 5, no. 2 (3 May 2016); and Drakenberg, O. and Cesar, E., *Mali Environmental and Climate Change*, Sida Help-desk for Environment and Climate Change, 2013.

[34] Hegazi, Krampe and Smith (note 9).

[35] Hegazi, Krampe and Smith (note 9).

[36] Owonikoko and Momodu (note 10).

[37] Vivekananda et al. (note 18).

[38] Vivekananda et al. (note 18); and Moaveni, A., 'What would make a woman go back to Boko Haram? Despair', *The Guardian*, 14 Jan. 2019.

[39] Eklöw and Krampe (note 9).

status and increased prospects of marriage.[40] Some research also suggests that for some women and families trying to secure a marriage for their younger daughters, marriage to an al-Shabab fighter represents the potential of increased financial stability.[41] In Mali, there is evidence that increasing resource scarcity and related livelihood impacts due to the pressures of climate change, population pressure and conflict, may contribute to recruitment opportunities for armed non-state actors and criminal groups.[42] Should resource scarcity affect livelihoods, this may provide an economic incentive for joining armed groups.[43] Gender norms can influence the roles recruits may be compelled to take on within the groups. Young men and boys are the primary recruits as combatants in armed and criminal groups, whereas women and girls may take on more informal supporting roles including recruiting, gathering information, marrying combatants and providing other domestic or economic services.[44]

In each context, gender influences how men and women are exposed to and respond to different risks associated with adaptation to livelihood deterioration in conflict-affected settings.[45] In Lake Chad, men from pastoralist, fishing and agricultural communities migrate far into cities to find work. They are understood to be responsible for providing for their families, and social respect comes with their ability to do so. Women remain at home to care for the family unit and are left doubly at risk to the effects of both climate change and insecurity in the basin area.[46] Their gender impacts their ability to participate in market trading due to norms surrounding women's mobility, with women who are disabled or part of specific ethnic groups facing higher levels of discrimination.[47] However, despite numerous challenges, women consistently create ways to adapt to their circumstances. In Lake Chad, while women have more limited abilities to participate in formal decision-making surrounding resource and asset control, they consistently innovate approaches to adaptation and resilience in their settings. For example, with knowledge of seasonal weather patterns, they know where to find and harvest wild rice. This rice is dried and used for household and livestock food consumption.[48]

In Somalia, gender can influence adaptation strategies and risks for men and women. During periods of drought, men are often compelled to migrate to find water for livestock, while 'women and children are expected to stay at home and care for the other livestock'.[49] Should men leave their families to find water or pasture for their herds, women and children can be driven to move to IDP camps. Additionally, insecurity, exposure to violence, and lack of resources can challenge the capacity for men to achieve ideals of masculinity and lead to shifting gender norms. Men's limited ability to attain ideals of manhood within the conflict context can contribute to stressed family dynamics and changing gender roles, as women may take on the role of providing for the family.[50] This can, in different cases, lead to increased empowerment and financial independence for women. However, conservative contexts outside the household can continue to create challenges for women's equality and their individual and family adaptation to their circumstances through limiting access to economic resources and formal political decision-making, among other factors.[51] In Mali, different groups of women can also face greater challenges in adapting to climate change, as gender inequalities limit women's mobility as well as their access to land and other economic resources. Evidence from different communities dependent on livestock and forest-based livelihoods in northern Mali shows that under drought conditions, men will migrate in search of employment. This can increase workloads and inequalities for women, who remain behind and care for livestock in addition to their other responsibilities without additional income. While this dynamic creates heavier workloads for women, it is also notable as an example of shifting gender

[40] UNSOM, *Countering Al-Shabaab Propaganda and Recruitment Mechanisms in South Central Somalia* (UNSOM: 2017).

[41] International Crisis Group, *Women and al-Shabaab's Insurgency*, International Crisis Group, Briefing no. 145, 27 June 2019.

[42] Hegazi, Krampe and Smith (note 9); Dal Santo, E. and van der Heide, E. J., 'Escalating complexity in regional conflicts: Connecting geopolitics to individual pathways to terrorism in Mali', *African Security*, vol. 11, no. 3 (3 July 2018); Théroux-Bénoni, L.-A. and Assanvo, W., *Mali's Young 'Jihadists' Fuelled by Faith or Circumstance?*, Policy Brief no. 89 (Institute for Security Studies: Aug. 2016); and UNDP, Regional Bureau for Africa (note 18).

[43] Hegazi, Krampe and Smith (note 9).

[44] Gorman, Z. and Chauzal, G., *'Hand in Hand': A Study of Insecurity and Gender in Mali*, SIPRI Insights on Peace and Security no. 2019/6, Dec. 2019.

[45] Vivekananda et al. (note 18).

[46] Interview: Hindou.

[47] Vivekananda et al. (note 18).

[48] Interview: Hindou.

[49] UNDP, *Gender in Somalia* (UNDP: 2014).

[50] El-Bushra, J. and Gardner, J., 'The impact of war on Somali men: Feminist analysis of masculinities and gender relations in a fragile context', *Gender & Development*, vol. 24, no. 3 (Sep. 2016).

[51] El-Bushra and Gardner (note 50).

roles, as herding is traditionally a male responsibility.[52] As in Somalia, broader conservative ideologies can challenge women's adaptation in shifting environmental circumstances.[53]

Climate change and conflict also heightens the risk of sexual and gender-based violence (SGBV) for different groups women. In Somalia, research notes that women and girls in IDP camps can lack access to needed health services and are at risk of SGBV, and children often leave school to assist with household affairs.[54] More generally, should women need to walk farther distances to gather resources, they are put at an increased risk of SGBV.[55] While typical SGBV affects women on a larger scale, the exposure of men to this type of violence should not be ignored.[56] In Mali, women are typically responsible for gathering natural resources like water or fuel wood due to gender roles, and climate impacts can put them at increased risk for attack if they need to travel farther distances.[57] As in Somalia, SGBV typically affects women to a higher degree, although men and boys can also be victims.[58]

Summary and conclusions

Climate change, environmental crises and violent conflict impact different groups of people in varying ways depending on their gender. In each of the cases, resource-dependent livelihoods, gender and environmental deterioration intersect to create risks for different genders. Men and boys are notably vulnerable to recruitment into armed groups, and women and girls are at a heightened risk of experiencing sexual and gender-based violence. Gender norms and inequalities influence who migrates and what risks they may face when they do. Climate change and conflict can also shift traditional gender dynamics with impacts for both men and women, as highlighted, in Mali and Somalia.

Efforts to prevent and address these risks need to include the equal and active participation of all affected groups in related formal decision-making. Gender can influence the relationship of different individuals with their natural environments. How different people depend on and manage natural resources for their livelihoods, and the related knowledge they have about their local ecosystems can all be affected by gender.[59] As shown in the Lake Chad example, women innovate resilient ways for themselves and their broader communities to adapt to environments affected by climate change and insecurity.[60] Any efforts aimed at addressing climate change, environmental degradation and associated security risks should be built around local knowledge and dynamics, with an understanding of the gendered risks men and women may face, and the formal and informal roles they play in adaptation and resolving local conflicts around natural resource access.[61]

[52] Djoudi, H. and Brockhaus, M., 'Is adaptation to climate change gender neutral? Lessons from communities dependent on livestock and forests in northern Mali', *International Forestry Review*, vol. 13, no. 2 (1 June 2011).

[53] Djoudi and Brockhaus (note 52).

[54] United Nations Population Fund, 'Drought in Somalia forces displacement, posing particular challenges for women and girls', 22 Apr. 2021.

[55] Human Rights Watch, *'Here, Rape Is Normal': A Five-Point Plan to Curtail Sexual Violence in Somalia* (Human Rights Watch: New York, Feb. 2014).

[56] Eklöw and Krampe (note 9).

[57] McOmber, C., *Women and Climate Change in the Sahel*, West African Papers no. 27 (Organisation for Economic Co-operation and Development: Paris, 9 Mar. 2020); and Gorman and Chauzal (note 44).

[58] Gorman and Chauzal (note 44).

[59] United Nations Environment Programme et al., *Gender, Climate and Security: Sustaining Inclusive Peace on the Frontlines of Climate Change* (UN Environment Programme: Nairobi, 6 Nov. 2020); Djoudi and Brockhaus (note 52); and Tanyag and True (note 8).

[60] Interview: Hindou.

[61] Interview: Hindou; Owonikoko and Momodu (note 10); and Coomaswaramy et al. (note 3).

5. The Indus River Basin

David Michel

The Indus River Basin is one of the most important water systems in Asia, nourishing the agricultural breadbaskets of the subcontinent. The basin constitutes one of the most intensively cropped and heavily irrigated areas on Earth. Agriculture absorbs 93 per cent of all water withdrawn from the Indus River and the basin's underground aquifers.[1] The Indus also holds considerable hydropower potential in a region where hundreds of millions of people lack access to electricity.

Growing populations and expanding economies are driving rising water demand throughout the Indus Basin, even as environmental pressures and unsustainable consumption practices stretch supplies. Long-term renewable water resources in the Indus system average 287 cubic kilometres per year. Against these supplies, estimated annual water demand ranges from 257–299 km^3.[2]

Climate change will exacerbate pressures on the Indus. Global warming threatens to upset the prevailing regional weather patterns, disrupting the quantity, timing and location of rain and snowfall that sustain the basin's water sources.[3] India and Pakistan presently possess little capacity to buffer prolonged fluctuations in water availability. Pakistan's reservoirs, for example, supply water storage equivalent to only 34 days of Indus inflows.[4]

In the face of growing challenges, fraught hydro-relations divide the Indus' two main riparians (India and Pakistan together account for 99 per cent of basin water demand.) The frontier that partitioned former British India in 1947, setting India and Pakistan apart at independence, also set them at odds over water. While the Indus River system contains multiple tributaries, the six most significant branches run westward through India before traversing into Pakistan (a seventh major tributary, the Kabul River, originates in Afghanistan, entering Pakistan from the west.)[5] The new international boundary bisected these six main tributaries and the British-built canal networks irrigating the region's agriculture. Suddenly severed from vital river sources rising beyond its borders, downstream Pakistan feared Indian water demands could deprive it of its historic rights to Indus flows, imperilling its economy and food security. Upstream India, for its part, affirmed its sovereign right to develop rivers running on its own territory. Persistent tensions between the two states drew the World Bank to mediate their dispute, culminating in the 1960 Indus Waters Treaty (IWT).[6]

Though considered a diplomatic success, the IWT is often characterized as erecting a 'riparian iron curtain'.[7] The treaty divides the river physically, splitting the fan of six major tributaries comprising the Indus system. It allots full use of the three western rivers to Pakistan. India must allow these rivers to flow freely through its territory except for restricted uses related to municipal demand, agricultural needs and hydropower generation. India in turn receives full rights to the three eastern rivers. When these eastern branches exit India, they become available to Pakistan.[8]

[1] Siebert, S., Portmann, F. T. and Döll, P., 'Global patterns of cropland use intensity', *Remote Sensing*, vol. 2, no. 7 (24 June 2010); Siebert, S. et al., *Update of the Digital Global Map of Irrigation Areas to Version 5* (Food and Agriculture Organization of the United Nations, FAO/Institute of Crop Science and Resource Conservation: Rome/Berlin, Oct. 2013); and FAO AQUASTAT, *Indus Basin*, Water Report no. 37 (FAO: Rome, 2011), p. 9.

[2] Indus Basin Working Group, *Connecting the Drops: An Indus Basin Roadmap for Crossborder Water Research, Data Sharing, and Policy Coordination* (Stimson Center: Washington, DC, 2013), p. 15.

[3] A. F. Lutz et al., 'Climate change impacts on the Upper Indus Hydrology: sources, shifts and extremes', *PLOS ONE*, vol. 11, no. 11 (2016); and Krishnan, R. et al., 'Unravelling climate change in the Hindu Kush Himalaya: Rapid warming in the mountains and increasing extremes', eds P. Wester et al., *The Hindu Kush Himalaya Assessment* (Springer International Publishing: Cham, 2019).

[4] Young, W. J. et al., *Pakistan: Getting More from Water* (World Bank: Washington, DC, 2019), p. 46.

[5] FAO AQUASTAT (note 1).

[6] Haines, D., *Rivers Divided: Indus Basin Waters in the Making of India and Pakistan* (Oxford University Press: New York, 2017).

[7] Observer Research Foundation and Lahore University of Management Sciences, *Re-imagining the Indus* (Observer Research Foundation/Lahore University of Management Sciences: New Delhi/Lahore, 2011), p. 6.

[8] Miner, M. et al., 'Water sharing between India and Pakistan: A critical evaluation of the Indus Water Treaty', *Water International*, vol. 34, no. 2 (21 May 2009); Sinha, U. K., Gupta, A. and Behuria, A., 'Will the Indus Water Treaty survive?', *Strategic Analysis*, vol. 36, no. 5 (Sep. 2012); Salman, S. M. A. and Uprety, K., 'Shared watercourses and water security in South Asia: Challenges of negotiating and enforcing treaties', *International Water Law*, vol. 3, no. 8 (2018); and Akhter, M., 'Adjudicating infrastructure: Treaties, territories, hydropolitics', *Environment and Planning E: Nature and Space*, vol. 2, no. 4 (Dec. 2019).

Rancour and mutual mistrust surround the treaty in both countries. Pakistani critics assert that Indian infrastructure building on the western rivers detrimentally affects flows to Pakistan. Though individual Indian projects may obey the treaty's strictures, many analysts in Pakistan fear each additional installation incrementally increases India's capacity to regulate flows downriver, augmenting its potential ability to strangle Pakistan's economy. India counters that its works on the western rivers consist in 'run-of-the-river' structures, meaning they do not possess the technical capacity to withhold significant volumes of water. Pakistan's water woes stem from its own wasteful practices, these critics contend. Substantial Indian opinion condemns recurring Pakistani objections to Indian projects as cynically obstructing India's legitimate development.[9]

Born in the bitter legacy of Partition, Indus water governance intertwines with the politics of national security and territorial sovereignty. The basin's three western rivers flow through contested Jammu and Kashmir, claimed by both countries. Voices among Pakistani policymakers and the press accuse India of using dams in Jammu and Kashmir to restrict river flows destined for Pakistan to foster famine, or to suddenly release stored waters to aggravate flooding. Militant groups such as Lashkar-e-Taiba, responsible for the 2008 Mumbai attack, threaten to bomb India's dams and menace war to recapture Pakistan's rightful water.[10] According to a former Army Chief of Staff, Pakistan's military posture will remain 'India-centric' until the Kashmir and water disputes are settled.[11]

Indian policymakers and pundits take opposite positions. Many advocate conditioning India's continued compliance with the IWT to compel Islamabad to rein in domestic extremists.[12] In retaliation for Pakistani militant attacks, many press for curtailing all remaining flows to Pakistan from the already heavily utilized eastern rivers.[13] In the longer term, some analysts conjecture that climate impacts and water shortages in Pakistan, coupled with institutional incapacity to meet these challenges, could spark civil strife, destabilizing the Pakistani state.[14] Although it names no specific adversaries, the Joint Doctrine of the Indian Armed Forces identifies climate change, environmental disasters, and rising competition for natural resources as conflict risks and potential geopolitical threats shaping India's security.[15]

At the regional level, continuing turmoil in Afghanistan and remote geography in China have so far largely inhibited developing their Indus resources. But water demands in both countries are climbing. Pakistan worries prospective Afghan infrastructure projects could divert flows from the Kabul River, which provides 16 per cent of Pakistan's water supplies. New Delhi's reported assistance to erect 12 dams on the Kabul feeds Pakistani apprehensions of encirclement by its Indian rival.[16] By the same token, some 182 km^2 of the Indus' annual flow enters India from China, raising Indian concerns about the impacts of Chinese designs upstream. Sizable Chinese investments in Pakistani hydropower projects under the Belt and Road Initiative—with many construction sites situated in contested Kashmir and guarded by Chinese security personnel—similarly discomfits New Delhi.[17]

[9] Miner et al. (note 8); Sinha, U., Gupta, A. and Behuria, A., 'Will the Indus Water Treaty survive?', *Strategic Analysis* 36, no. 5 (2012); Salman and Uprety (note 8); and Akhter, M., 'Adjudicating infrastructure: Treaties, territories, hydropolitics', *Environment and Planning E: Nature and Space* (July 2019).

[10] Gronewald, N., 'Climate change, deforestation and corruption combine to drown a region', *E&E News*, 13 Oct. 2010; Bagla, P., 'Along the Indus River, saber rattling over water security', *Science*, vol. 328, no. 5983 (4 June 2010); 'South Asia's water: Unquenchable thirst', *The Economist*, 19 Nov. 2011; Faraz, S., 'When will Pakistan stop blaming India for its water crisis?', TheThirdPole.Net, 10 Sep. 2014; and Quereshi, W. A., 'Water as a human right: A case study of the Pakistani-India water conflict', *Penn State Journal of Law & International Affairs*, vol. 5, no. 2 (2017).

[11] 'Kayani spells out threat posed by Indian doctrine', *Dawn*, 4 Feb. 2010.

[12] Institute for Defence Studies and Analyses (IDSA) Task Force, *Water Security for India: The External Dynamics* (IDSA: New Delhi, 2010); Chellaney, B., *Water: Asia's New Battleground* (Georgetown University Press: Washington, DC, 2011); and 'India should end Indus Waters Treaty with Pakistan: Yashwant Sinha', *Financial Express*, 27 Sep. 2016.

[13] Singh Khadka, N., 'Are India and Pakistan set for water wars?', BBC News, 22 Dec. 2016; and Gettleman, J., 'India threatens a new weapon against Pakistan: Water', *New York Times*, 21 Feb. 2019.

[14] Bisht, M., *Water Sector in Pakistan: Policy, Politics, Management*, IDSA Monograph Series no. 18 (Institute for Defence Studies and Analyses: New Delhi, Apr. 2013).

[15] Headquarters Integrated Defence Staff, *Joint Doctrine Indian Armed Forces* (Indian Ministry of Defence: New Delhi, 2017).

[16] Sexton, R., *Natural Resources and Conflict in Afghanistan* (Afghanistan Watch: Kabul, July 2012); Mustafa, K., 'India out to damage Pakistan's water interests on Kabul River', *The News*, 5 June 2016; and Thomas, V., Azizi, M. A. and Behzad, K., *Developing Transboundary Water Resources: What Perspectives for Cooperation between Afghanistan, Iran and Pakistan?* (Afghanistan Research and Evaluation Unit: Kabul, 2016).

[17] IDSA Task Force (note 12); and Kondapalli, S., 'The Indus Basin: The potential for basin-wide management between China and its Himalayan neighbours India and Pakistan', eds Z. Adeel and R. G. Wirsing, *Imagining Industan: Water Security in a New World* (Springer International Publishing: Cham, 2017).

Since 1960, the treaty has held unbroken through two wars and withstood numerous lesser clashes. Yet the IWT offers little response to many emerging risks. Negotiated when global warming was unsuspected outside a tiny scientific circle, the treaty includes no mechanism to manage the shifts in water availability that climate change could engender. And beyond neglecting particular issues, the IWT also omits particular parties, the river's other riparians Afghanistan and China.[18]

Indian and Pakistani policymakers recognize the dangers of mounting water stress on the Indus. Their declared national water policies emphasize the need for more effective and integrated water resources management and call for cooperation on transboundary waters.[19] Yet, water policy in both countries has become highly securitized, framing water governance as a zero-sum conflict of existential threats, endangered sovereignty, and national survival.[20] Such predominating logics of 'water nationalism' and perceived geopolitical imperatives undermine the prospects for productive cooperation.[21]

[18] Zawahri, N. and Michel, D., 'Assessing the Indus Waters Treaty from a comparative perspective', *Water International*, vol. 43, no. 5 (4 July 2018).

[19] Indian Ministry of Water Resources (IMWR), *National Water Policy, 2012* (IMWR: New Delhi, 2012); and Pakistani Ministry of Water Resources (PMWR), *National Water Policy, 2018* (PMWR: Islamabad, 2018).

[20] Burgess, J. P., Owen, T. and Sinha, U. K., 'Human securitization of water? A case study of the Indus Waters Basin', *Cambridge Review of International Affairs*, vol. 29, no. 2 (2 Apr. 2016); and Williams, J., 'Stagnant rivers: Transboundary water security in South and Southeast Asia', *Water*, vol. 10, no. 12 (10 Dec. 2018).

[21] Ranjan, A., 'Disputed waters: India, Pakistan and the transboundary rivers', *Studies in Indian Politics*, vol. 4, no. 2 (Dec. 2016); and Hill, D., 'The Indus Basin: The Potential for Basin-Wide Management Between India and Pakistan', Adeel and Wirsing, eds (note 17).

6. Oceans

David Michel

Healthy ocean ecosystems are essential to human well-being. Covering more than 70 per cent of Earth's surface, the oceans constitute the planet's largest habitat, comprising some of its richest ecosystems. Marine biomes—the 'ecoregions' formed by the ocean shelves, surface waters and deep seas—are estimated to contain some 300 000 to 2.2 million plant and animal species, with many yet to be discovered and described by science.[1] Together, the world's oceans provide humanity with a vast array of vital natural resources and services. According to the OECD, the global 'ocean economy' represented by industries such as fisheries, offshore energy and marine biotechnology generates $1.5 trillion in yearly output and will double in size by 2030.[2] Beyond direct economic outputs, the oceans ensure ecosystem services valued many times higher. Ocean and marine ecosystems such as coral reefs and mangroves furnish benefits ranging from food and raw materials to genetic resources, climate regulation, and buffers against coastal flooding and erosion. One assessment calculates the annual value of goods and services supplied by the seas at $491 per hectare of open ocean, amounting to $18 trillion per year across the oceans as a whole.[3] Worldwide, more than 775 million people depend significantly on ocean ecosystems for their nutritional needs, livelihoods, or protection from natural disasters (see figure 6.1).[4]

Sustainable Development Goal (SDG) 14 of the UN 2030 Agenda for Sustainable Development enjoins the international community to 'conserve and sustainably use the oceans, seas and marine resources for sustainable development'.[5] Yet the oceans face rapidly mounting pressures from environmental degradation and human exploitation. Habitat destruction, biodiversity loss, pollution, extensive resource depletion, and the escalating effects of greenhouse gas emissions and global climate change increasingly threaten marine resources and ecosystems.[6] No area of the world's seas escapes these strains, and nearly the entirety of the ocean (97.7 per cent) suffers several stresses simultaneously.[7]

Worsening human strains on the oceans can cumulate in complex combinations. For example, extensive bottom trawling—towing fishing nets along the ocean floor—scours the seabed, destroying crucial habitats and exacerbating overfishing by indiscriminately ensnaring wanted and unwanted species alike. At the same time, bottom trawling stirs up carbon-storing sediments, releasing CO2 that increases ocean acidification and intensifies climate change.[8] Multiple stresses interact, generating compound risks beyond the sum of individual pressures and potentially pushing marine systems over tipping points past which they cannot recover.[9] For countries and communities reliant on ocean ecosystems, the ramifications could be considerable, jeopardizing the livelihoods, health and welfare of millions of people.

[1] Brondízio, E. S. et al., *The Global Assessment Report on Biodiversity and Ecosystem Services* (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, IPBES, Secretariat: Bonn, 2019), pp. 33, 35; and Luypaert, T. et al., 'Status of marine biodiversity in the Anthropocene', eds S. Jungblut, V. Liebich and M. Bode-Dalby, *YOUMARES 9: The Oceans: Our Research, Our Future* (Springer International Publishing: Cham, 2020), p. 60.

[2] Organisation for Economic Co-operation and Development (OECD), *The Ocean Economy in 2030* (OECD: Paris, 27 Apr. 2016), pp. 23–24, 30.

[3] de Groot, R. et al., 'Global estimates of the value of ecosystems and their services in monetary units', *Ecosystem Services*, vol. 1, no. 1 (July 2012), p. 55.

[4] Selig, E. R. et al., 'Mapping global human dependence on marine ecosystems', *Conservation Letters*, vol. 12, no. 2 (Mar. 2019).

[5] United Nations, General Assembly, 'Transforming our world: The 2030 Agenda for Sustainable Development', A/RES/70/1 (21 Oct. 2015).

[6] Brondízio et al. (note 1); and Baker, E. et al., 'Oceans and coasts', *Global Environment Outlook: GEO-6: Healthy Planet, Healthy People* (United Nations Environment Programme: Nairobi, 2019).

[7] Halpern, B. S. et al., 'Spatial and temporal changes in cumulative human impacts on the world's ocean', *Nature Communications*, vol. 6, no. 1 (14 July 2015), p. 3.

[8] Victorero, L. et al., 'Out of sight, but within reach: A global history of bottom-trawled deep-sea fisheries from >400 m depth', *Frontiers in Marine Science*, vol. 5 (11 Apr. 2018); and Sala, E. et al., 'Protecting the global ocean for biodiversity, food and climate', *Nature*, vol. 592 (15 Apr. 2021), pp. 397–402.

[9] Crain, C. M., Kroeker, K. and Halpern, B. S., 'Interactive and cumulative effects of multiple human stressors in marine systems', *Ecology Letters*, vol. 11, no. 12 (Dec. 2008); Halpern, B. S. et al., 'Recent pace of change in human impact on the world's ocean', *Scientific Reports*, vol. 9, no. 1 (Dec. 2019); and Heinze, C. et al., 'The quiet crossing of ocean tipping points', *Proceedings of the National Academy of Sciences*, vol. 118, no. 9 (2 Mar. 2021).

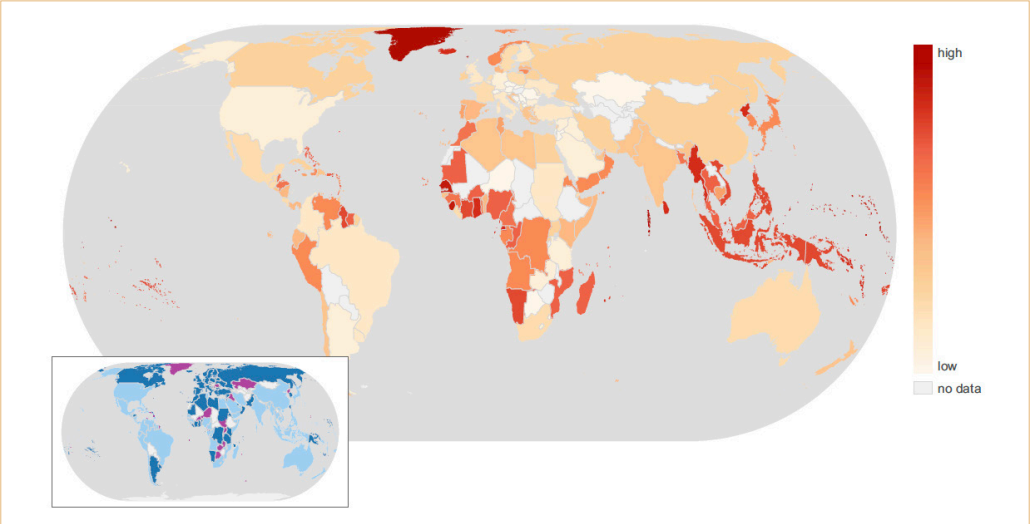

Figure 6.1. Human dependence on marine ecosystems

Integrated human dependence on marine ecosystems and number of types of dependence calculated (inset). The integrated map is the mean of nutritional, economic (fisheries), and coastal protection dependence scores. In the inset, the number of dependence types used for the calculations is shown (purple = 1, blue = 2, and light blue = 3 types).

Source: Selig, E. R. et al., 'Mapping global human dependence on marine ecosystems', *Conservation Letters*, vol. 12, no. 2 (Mar. 2019).

Fisheries, food security and sustainability

The oceans provide food and livelihoods to billions of people. Fisheries and aquaculture directly employ 59.5 million people, the vast majority of them (85 per cent) in Asia.[10] When small-scale and subsistence fishing and work in ancillary sectors such as processing, boatbuilding, and equipment repair are accounted for, estimates suggest that 260 million people engage in marine fisheries activities.[11] Including both primary and secondary sectors, half of all seafood workers are women.[12] Fisheries also contribute substantially to many national economies, representing 3.2 per cent of developing countries' GDP on average. Certain Small Island Developing States (SIDS) such as Marshall Islands, Seychelles, and Kiribati derive one quarter to one half of their GDP from the fisheries sector.[13]

Equally important, fisheries supply essential sustenance to populations worldwide. Globally, fish provide over 3.3 billion people with 20 per cent of their average per capita consumption of animal proteins. In several island and coastal countries, from Sri Lanka and Sierra Leone to Bangladesh, Gambia, Ghana and Indonesia half of per capita animal proteins consumed come from fish.[14] Steadily increasing fisheries catches—and expanding aquaculture—have enabled global fish production to keep pace with the growing world population and mounting demand. Production from marine capture fisheries and marine aquaculture has tripled from roughly 40 million tonnes in 1962 to 115.2 million tonnes in 2018. Over the same period, annual per capita fish consumption rose fourfold from 5.2 kg in 1961 to 19.4 kg in 2017.[15] As the world searches for strategies to sustainably feed an additional 2 billion inhabitants in 2050, many experts project global demand for 'blue foods' from aquatic sources will nearly double by mid-century.[16]

Yet relentlessly rising demand increasingly risks overstretching the ocean's resources. According to the UN Food and Agriculture Organization, 59.6 per cent of ocean fish stocks are

[10] Food and Agriculture Organization of the United Nations (FAO), *The State of World Fisheries and Aquaculture 2020* (FAO: Rome, 2020), p. 37.
[11] Teh, L. C. L. and Sumaila, U. R., 'Contribution of marine fisheries to worldwide employment: Global marine fisheries employment', *Fish and Fisheries*, vol. 14, no. 1 (Mar. 2013).
[12] FAO (note 10), p. 39.
[13] World Bank, *Hidden Harvest: The Global Contribution of Capture Fisheries*, Economic and Sector Work 66469-GLB (World Bank: Washington, DC, May 2012), pp. 57, 64–67.
[14] FAO (note 10), p. 5.
[15] FAO (note 10), pp. 3–5. FAO production statistics distinguish marine (ocean) capture fisheries and marine aquaculture, and inland capture fisheries and inland aquaculture conducted in freshwater bodies.
[16] Naylor, R. L. et al., 'Blue food demand across geographic and temporal scales', *Nature Communications*, vol. 12, no. 5413 (Dec. 2021).

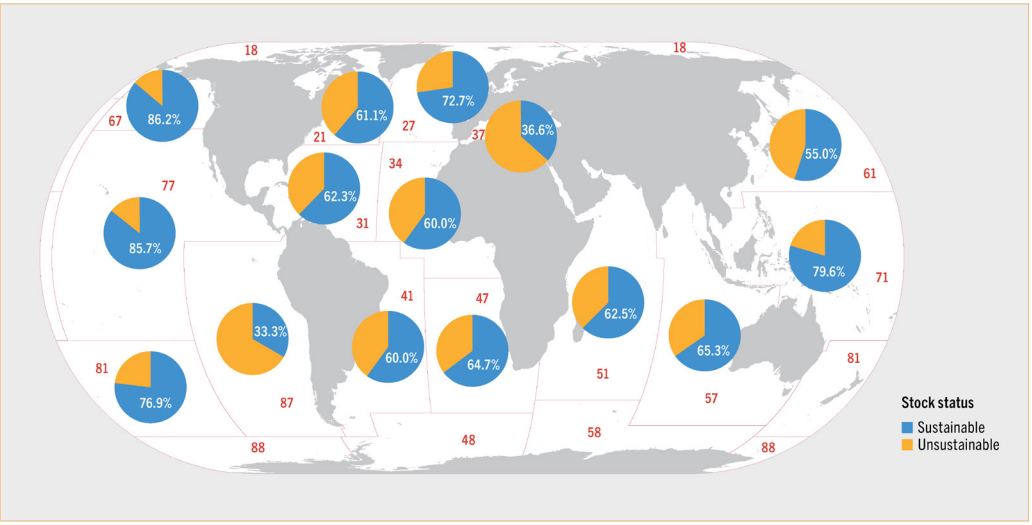

Figure 6.2. Percentages of biologically sustainable and unsustainable fishery stocks by FAO major fishing area, 2019

Source: Food and Agriculture Organization of the United Nations (FAO), *The State of World Fisheries and Aquaculture 2020* (FAO: Rome, 2020).

now fished to their maximum sustainable levels. More than one third (34.2 per cent) of marine fish stocks were exploited beyond biologically sustainable levels in 2017, compared to 10 per cent in 1974. Overfishing affects all the world's major fishing areas, ranging from 13 per cent of stocks unsustainably exploited in the Eastern Central Pacific to 62.5 per cent in the Mediterranean Sea and Black Sea (see figure 6.2).[17]

Even these dire statistics may not capture the extent of the strains weighing on world fisheries. Many major species and fishing areas have not been scientifically evaluated due to inadequate data. Most global fish populations and roughly half of all marine fisheries landings remain formally 'unassessed'.[18] Significant knowledge gaps especially afflict the smaller stocks and data-limited fishing areas, such as the Western Indian Ocean and South and South East Asia, which are most important to livelihoods and food security for low-income populations.[19] The available evidence suggests the sustainability status of these unassessed stocks is likely poor and, in many cases, declining.[20]

Overfishing is far from the only hazard facing the oceans. Habitat loss and degradation endanger the health and resilience of many marine ecosystems. Plastic pollution, for instance, significantly threatens marine life, as animals ingest plastic particles or become entangled in marine litter.[21] Humanity now generates so much plastic waste that one study calculates the oceans will contain more plastic than fish (by weight) in 2050.[22] Many pollutants from human activities enter the oceans from runoff, as rain and snowfall carry contaminants into rivers and streams that then discharge them into the sea. In this way, hundreds of millions of tonnes of fertilizer used for agriculture in past decades have washed vast quantities of excess nutrients—primarily nitrogen and phosphorous—into the oceans. There, together with other human and industrial effluents, they feed biochemical processes of 'eutrophication' that progressively deplete ocean waters of the oxygen needed for biological and ecological functions. Hundreds of low-oxygen sites, sometimes called 'dead zones', have spread throughout the world's oceans (see figure 6.3). Since the 1960s, such 'hypoxic' zones have grown by more than 4.5 million square kilometres, an area larger than all the countries of the European Union combined.[23]

[17] FAO (note 10), pp. 47, 49.

[18] Blasco, G. D. et al., 'Substantial gaps in the current fisheries data landscape', *Frontiers in Marine Science*, vol. 7 (17 Dec. 2020); and Ovando, D. et al., 'Improving estimates of the state of global fisheries depends on better data', *Fish and Fisheries* (19 July 2021), pp. 1–2.

[19] Ovando et al. (note 18), p. 2; and Melnychuk, M. C. et al., *Global Trends in Status and Management of Assessed Stocks: Achieving Sustainable Fisheries through Effective Management* (FAO: Rome, 2020), p. 124.

[20] Hilborn, R. et al., 'Effective fisheries management instrumental in improving fish stock status', *Proceedings of the National Academy of Sciences*, vol. 117, no. 4 (13 Jan. 2020), pp. 2218–24.

[21] Baker, E. et al. (note 6), pp. 185–89.

[22] World Economic Forum, *The New Plastics Economy: Rethinking the Future of Plastics* (World Economic Forum: Geneva, Jan. 2016), p. 7.

[23] Breitburg, D., Marilaure, G. and Isensee, K., *The Ocean Is Losing Its Breath: Declining Oxygen in the World's Ocean and Coastal Waters*, Summary for Policymakers (Intergovernmental Oceanographic Commission–UNESCO: Paris, 2018).

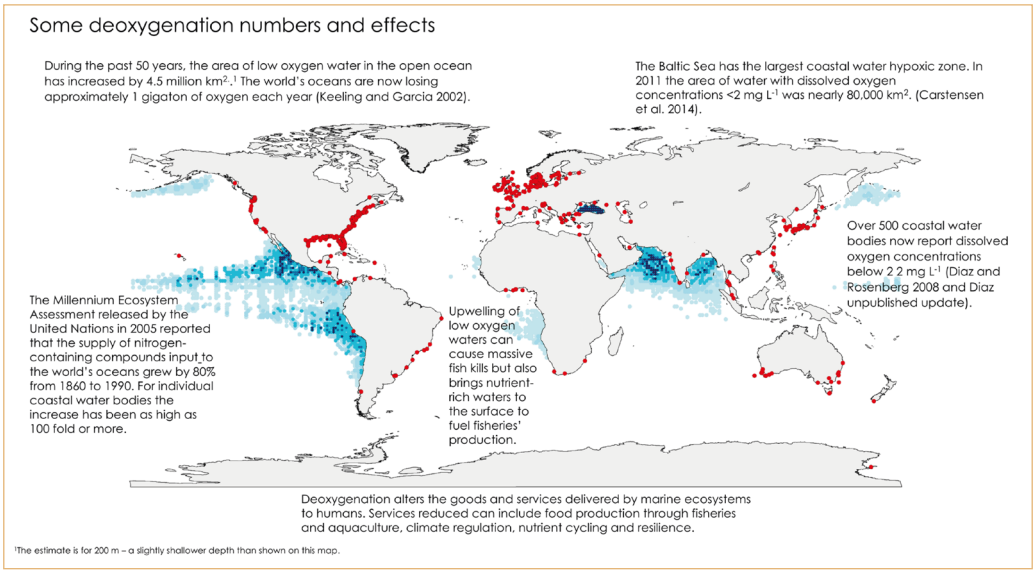

Figure 6.3. OMZs (blue) and areas with coastal hypoxia (red) in the world's ocean

Source: Breitburg, D., Marilaure, G. and Isensee, K., *The Ocean Is Losing Its Breath: Declining Oxygen in the World's Ocean and Coastal Waters*, Summary for Policymakers (Intergovernmental Oceanographic Commission–UNESCO: Paris, 2018).

Climate change impacts on ocean ecosystems and resources

Climate change will expose fisheries and fisher communities to increasing risks at sea and on shore. Projected impacts from global warming include rising sea levels, stronger tropical cyclones, larger storm surges, climbing sea surface temperatures, and the acidification and deoxygenation of ocean waters.[24] Strong storms can distress the very ecosystems, such as reefs and mangroves, that buffer coastal communities from ocean waves and flooding and that also provide habitat and breeding grounds to marine life. They can likewise damage or destroy ports, docks, boats and equipment, and storage and processing facilities.[25] Typhoon Haiyan, for example, which struck the central Philippines in November 2013, wrecked 30 000 fishing boats and affected more than 200 000 fisher households.[26]

Further climate change impacts manifest in the ocean itself. As greenhouse gas emissions soar, the ocean absorbs increasing amounts of added carbon dioxide from the atmosphere. Since the Industrial Revolution, the ocean has sopped up one-third of humanity's total CO2 emissions. This rising CO2 content renders seawater more acidic (measured by a lower pH value). As a result, surface ocean acidity has spiked 30 per cent from pre-Industrial levels—corresponding to a drop in pH of about 0.1 units—a change ten times faster than any in the past 300 million years.[27]

Similarly, as climate change drives up global average temperatures, the seas also absorb heat from the atmosphere. The oceans have soaked up 93 per cent of the supplemental heat generated by global warming, boosting sea surface temperatures between 2011 and 2020 by 0.68–1.01°C above the averages of 1850–1900.[28] Extreme marine heat waves that kill seabirds and mammals, fuel coral bleaching, and push tropical fish communities poleward to cooler waters have increased more than 20-fold.[29] Warming sea surface temperatures also crucially modify the thermal structure of the ocean. The shifting 'stratification' of the ocean in different temperature layers in turn alters the circulation of ocean currents and the absorption and distribution of

[24] Arias, P. A. et al., 'Technical summary', eds V. Masson-Delmotte et al., *Climate Change 2021: The Physical Science Basis: Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*, IPCC (Cambridge University Press: Cambridge and New York, 2021).

[25] Sainsbury, N. C. et al., 'Changing storminess and global capture fisheries', *Nature Climate Change*, vol. 8 (June 2018). pp. 655–59.

[26] Mayo Anda, G., *Rebuilding Fishing Communities and Fisheries: Post-Haiyan Reconstruction in the Philippines*, Joint agency briefing note (Oxfam International: Oxford, 2 Feb. 2014), pp. 2, 7.

[27] Hurd, C. L. et al., 'Current understanding and challenges for oceans in a higher-CO2 world', *Nature Climate Change*, vol. 8, no. 8 (Aug. 2018), pp. 686–94; and Doney, S. C. et al., 'The impacts of ocean acidification on marine ecosystems and reliant human communities', *Annual Review of Environment and Resources*, vol. 45 (Oct. 2020), p. 86.

[28] Cheng, L. et al., 'How fast are the oceans warming?', *Science*, vol. 363, no. 6423 (11 Jan. 2019), p. 128; and Fox-Kemper, B. et al., 'Ocean, cryosphere and sea level change', Masson-Delmotte et al., eds (note 24).

[29] Laufkötter, C., Zscheischler, J. and Frölicher, T. L., 'High-impact marine heatwaves attributable to human-induced global warming', *Science*, vol. 369, no. 6511 (25 Sep. 2020).

essential oxygen and nutrients through the ocean depths.[30] If greenhouse emissions and climate change continue unabated, the ocean surface pH could tumble 0.44 more points and sea surface temperatures could warm another 3.5°C by century's end.[31]

Ongoing ocean warming and acidification could significantly compromise marine organisms and ecology, affecting the physiology, reproduction and growth of individual species as well as the relations between species and their habitats, food sources, competitors, predators, and pathogens. Some marine populations will succeed in adapting, while others will migrate to more hospitable habitats. By 2100, 23–35 per cent of maritime national Exclusive Economic Zones (EEZs) will host new transboundary fishery stocks driven to their waters by climate stresses.[32] Many species, though, may not survive. In the tropical ocean, for example, coral reefs host some 30 per cent of all marine biodiversity. Climate pressures now imperil over two thirds of the world's reefs with long-term deterioration from coral bleaching.[33] In extreme cases, extensive coral erosion and reef habitat collapse could slash reef fish abundance and biodiversity by more than 60 per cent.[34]

Globally, one recent report examining over 200 fish populations concluded that climate change impacts have already cut world marine fisheries' productivity by 4.1 per cent since the 1930s. Maximum sustainable fish yields have risen slightly in some ecoregions, the study found, but plunged dramatically in others.[35] Going forward, climate change impacts could engender sizable shifts in marine fishery catch sizes and locations. Under 'business-as-usual' scenarios of largely unchecked climate change, models project that the maximum catch potential of global EEZs could drop 7–12 per cent by 2050 relative to 2000. Notably, the projected changes vary greatly from region to region. Depending on the specific models deployed, catch potentials across the tropics and in the temperate Atlantic plummet 30-40 per cent or further. In many high-latitude Arctic and Southern Ocean fisheries, in contrast, catch potentials shrink more modestly or increase somewhat. And in some modelling of some Arctic fisheries, potential catches swell 50 per cent or more.[36] Marine aquaculture, one of the world's fastest growing food sectors, will experience similarly varied impacts. However, production potential could expand in some places, largely in polar and subpolar EEZs. But the major producer countries in Asia and seafood-reliant nations in the Indo-Pacific are projected to see deepening declines by mid-century.[37]

Such a significant shuffle of fishing potential could substantially reshape global fisheries' politics and development. Rising catch potentials in the Arctic and Southern Oceans could draw in competing fishing fleets from farther afield, even as falling yields in the Atlantic and East Asian regions push their fishers to seek out new sources. Diminishing catches in much of the tropics would especially undermine food security, livelihoods, and development prospects in many SIDS and coastal developing countries.[38] These nations tend to have higher nutritional and economic dependencies on fisheries, higher levels of food insecurity, and greater exposure to climate impacts. They also typically possess lower adaptive capacities and weaker governance mechanisms to manage ocean resources. They are therefore disproportionately vulnerable to the combined pressures of overfishing and the compound risks of climate change. Most at risk of all are the SIDS and the coastal nations of South East Asia, East Africa, West Africa and the Caribbean.[39]

[30] Baylor Fox-Kemper et al. (note 28).

[31] Kwiatkowski, L. et al., 'Twenty-first century ocean warming, acidification, deoxygenation, and upper-ocean nutrient and primary production decline from CMIP6 model projections', *Biogeosciences*, vol. 17, no. 13 (6 July 2020).

[32] Pinsky, M. L. et al., 'Preparing ocean governance for species on the move', *Science*, vol. 360, no. 6394 (June 15, 2018), pp. 1189–91.

[33] Baker, E. et al. (note 6), p. 181.

[34] Pratchett, M. S. et al., 'Effects of coral bleaching and coral loss on the structure and function of reef fish assemblages', eds M. J. H. van Oppen and J. M. Lough, *Coral Bleaching: Patterns, Processes, Causes and Consequences*, Ecological Studies, vol. 233 (Springer International Publishing: Cham, Switzerland, 2018).

[35] Free, C. M. et al., 'Impacts of historical warming on marine fisheries production', *Science*, vol. 363, no. 6430 (1 Mar. 2019), pp. 979–83.

[36] Cheung, W. W. L., Bruggeman, J. and Butenschön, M., 'Projected changes in global and national potential marine fisheries catch under climate change scenarios in the twenty-first century', *Impacts of Climate Change on Fisheries and Aquaculture: Synthesis of Current Knowledge, Adaptation and Mitigation Options*, Technical Paper no. 627 (FAO: Rome, 2018).

[37] Froehlich, H. E., Gentry, R. R. and Halpern, B. S., 'Global change in marine aquaculture production potential under climate change', *Nature Ecology & Evolution*, vol. 2, no. 11 (Nov. 2018).

[38] Ding, Q. et al., 'Vulnerability to impacts of climate change on marine fisheries and food security', *Marine Policy*, vol. 83 (Sep. 2017); Blasiak, R. et al., 'Climate change and marine fisheries: least developed countries top global index of vulnerability', *PLOS ONE*, vol. 12, no. 6 (20 June 2017); and Lam, V. W. Y. et al., 'Climate change, tropical fisheries and prospects for sustainable development', *Nature Reviews Earth & Environment*, vol. 1, no. 9 (Aug. 2020).

[39] Cheung, W. W. L. et al., 'Opportunities for climate: Risk reduction through effective fisheries management', *Global Change Biology*, vol. 24, no. 11 (Nov. 2018); Boyce, D. G. et al., 'Future ocean biomass losses may widen socioeconomic equity gaps', *Nature Communications*, vol. 11, no. 2235 (2020); and Tigchelaar, M. et al., 'Compound climate risks threaten aquatic food system benefits', *Nature Food*, vol. 2, no. 9 (Sep. 2021).

Rising resource conflicts at sea?

Resource tensions are stoking a number of maritime conflicts around the world's oceans. Historically, ocean resources have been a significant source of international hostilities, even between developed democracies, accounting for over 43 per cent of militarized disputes between democratic states in the half-century following World War II.[40] The Anglo-Icelandic 'Cod Wars' of the 1950s–70s, for example, saw British Royal Navy ships tangle repeatedly with Icelandic patrol boats and Reykjavik threaten to withdraw from NATO and expel US forces from Iceland.[41] Since the 1970s, the numbers of international fisheries conflicts have significantly increased. Many have produced violent confrontations, with warships deployed, crews attacked, and vessels seized. Some have been deadly. Militarized clashes between foreign vessels have resulted in deaths among coast guards or crews.[42]

Growing anthropogenic pressures on the oceans could potentially catalyse future fisheries' conflict. Much of the global ocean is only weakly managed. Established national and international governance arrangements are largely premised on relatively stable fish populations (with catch allocations based on historical distribution patterns) and clear boundaries dividing fisheries into zones of national territorial control. Most international fisheries' conflicts revolve around disputes as to what parties are allowed to catch which species in what quantities, and where, as well as states' obligations to ensure that fishers comply with the law. The compounding risks of climate pressures and unsustainable fishing practices scramble these questions. A large-scale geographical redistribution in the sources and sizes of world fish catches—propelled by climate change—risks creating both 'winners' and 'losers'. Where fish populations fall, contending claimants may race to capture their share, further depleting shrinking stocks. Where fish populations grow, new parties may clash to cast their nets. Where fish migrate between national EEZs, tensions may flare over the allocation or reallocation of the shifting stocks.[43] The history of maritime resource confrontations suggests that conflict risks over fisheries may rise when fishers look to make up falling catches in domestic waters by increasing fishing abroad.[44]

Some of the most fraught and potentially combustible fisheries conflicts reflect competing claims not only to fish but to the seas around them. Asia, China, Indonesia, Vietnam, Malaysia, and the Philippines—in differing configurations—all assert sovereignty over various islands in the South China Sea, and therefore rights to the surrounding fisheries. All deploy their fishing fleets not only chasing dwindling catches but also acting as proxies to advance their maritime territorial claims in a collective display of competitive 'ocean grabbing'.[45] Indeed, China stands accused of operating its fishing fleet as a 'maritime militia'. All the littoral states have used their navies to intercept and destroy foreign fishing vessels, while Chinese and Vietnamese forces have fatally skirmished around the Spratly Islands.[46] Climate change could add a further twist to such territorial contests. The maritime boundaries of ocean spaces such as territorial seas and EEZs are based on terrestrial coastlines. Rising sea levels could gradually submerge many low-lying islands and coastal topographies, obliterating the land-based reference points defining these maritime territories and the resources they contain.[47]

Where rising seas do not obscure maritime borders, a good deal of global fishing operates outside them; and substantial illicit fishing practices have often sought to do so. Flag states have a responsibility under international law to both regulate the distant water fishing activities of vessels flying their flag and to enforce these laws against the companies and persons that own and control deep sea fishing vessels. A significant number of flag states have proven themselves to be unable or unwilling to uphold their international responsibility to ensure that ship owners fish in accordance with applicable norms when engaging in fishing activities abroad. Typically, these flag states do not exercise the requisite due diligence to prevent and deter harmful fishing

[40] McLaughlin Mitchell, S. and Prins, B. C., 'Beyond territorial contiguity: Issues at stake in democratic militarized interstate disputes', *International Studies Quarterly*, vol. 43, no. 1 (Mar. 1999).
[41] Steinsson, S., 'The cod wars: A re-analysis', *European Security*, vol. 25, no. 2 (2 Apr. 2016).
[42] Spijkers, J. et al., 'Global patterns of fisheries conflict: forty years of data', *Global Environmental Change*, vol. 57 (July 2019).
[43] Pinsky et al. (note 32); and Mendenhall, E. et al., 'Climate change increases the risk of fisheries conflict', *Marine Policy*, vol. 117 (July 2020).
[44] Spijkers, J. et al., 'Identifying predictors of international fisheries conflict', *Fish and Fisheries*, vol. 22, no. 4 (July 2021), p. 845.
[45] Bennett, N. J., Govan, H. and Satterfield, T., 'Ocean grabbing', *Marine Policy*, vol. 57 (July 2015).
[46] Thomas, M., 'Fish, food security, and future conflict epicenters', eds C. E. Werrell and F. Femia, *Epicenters of Climate and Security: The New Geostrategic Landscape of the Anthropocene* (Center for Climate and Security: Washington, DC, June 2017).
[47] Mendenhall et al. (note 43), p. 4.

Box 6.1. Illegal, unreported and unregulated fishing

Illegal fishing refers to fishing activities by a national or foreign vessel in the waters of a country, or by flag state vessels that are party to a Regional Fisheries Management Organization (RFMO), conducted in contravention of conservation and management measures.

Unreported fishing refers to fishing activities that have either not been reported or havebeen misreported to authorities.

Unregulated fishing refers to fishing activities in areas without any fisheries management or conservation measures, including the high seas and areas not managed by a RFMO. Fishing vessels without nationality or vessels of a country not party to a RFMO are also considered to be participating in unregulated fishing.

Source: Shaver, A. and Yozell, S., *Casting a Wider Net: The Security Implications of Illegal, Unreported, and Unregulated Fishing* (Stimson Center: Washington, DC, Jan. 2018), p. 6.

practices; that is, they do not have the laws or public administration in place to monitor and control their fleets or to effectively crack down on any lawbreaking.[48] In some cases, the flag state may turn a blind eye to harmful fishing practices to appease their own fishing industry and the public demand for seafood. But in other instances, the flag state is functionally similar to that of tax havens and offshore jurisdictions, in that the ship register is fully privatized and outsourced. These flag states' ship registers actively seek to attract foreign ship-owning companies to register their fishing fleets in their jurisdiction by allowing them to conduct illegal, unreported and unregulated (IUU) fishing on the high seas and in other countries' territories undeterred and with impunity (see box 6.1).[49]

Regardless of the underlying motivation, fishing companies are exploiting these flag states' legislative and enforcement gap, with the result that IUU fishing may account for as much as 20–50 per cent of the global fish catch, although any such estimates are inherently difficult.[50] IUU fishing occurs in all the world's fisheries and on all scales from the artisanal fisher to the industrial fleet, often alongside or in conjunction with legitimate fishing. Widespread IUU fishing significantly contributes to the over-exploitation pressures on many fisheries and undermines legitimate fishing economies, diminishing the resource base, subverting sustainable management, depriving states of revenues, weakening food security, and displacing or destabilizing small-scale and artisanal fisher communities.[51] Yet as demand for fish continues to rise, even as climate change and overfishing increasingly strain supplies, the incentives for IUU fishing—and the resulting conflict risks—may only grow.[52]

Beyond its environmental and economic impacts, IUU fishing often intertwines with multiple marine resource conflict risks and security threats. Not exercising the flag state jurisdiction effectively leads to enforcement vacuums, which means that IUU fishing frequently coincides with other illicit activities, from human rights violations in the fisheries labour force to marine piracy and the smuggling of narcotics and weapons (see figure 6.4).[53] In some cases, the peace and security ramifications have run deeper than issues of maritime criminality. From Somalia to West Africa, popular conceptions link the persistence of piracy in the Western Indian Ocean and the Gulf of Guinea to weak governance and enduring conflict in countries ashore. Deeper analyses suggest that the social and economic dislocations and climates of corruption and criminality

[48] International Tribunal on the Law of the Sea (ITLOS), Request for Advisory Opinion Submitted by the Sub-regional Fisheries Commission, Advisory Opinion, 2 Apr. 2015.

[49] de Coning, E., 'Why are some flag states unable or unwilling to address IUU fishing?', *International Community Law Review*, vol. 22, no. 3–4 (20 Aug. 2020).

[50] Pauly, D. and Zeller, D., 'Catch reconstructions reveal that global marine fisheries catches are higher than reported and declining', *Nature Communications*, vol. 7, no. 1 (Apr. 2016); and Macfayden, G., Caillart, B. and Agnew, D., *Review of Studies Estimating Levels of IUU Fishing and the Methodologies Utilized* (Poseidon Aquatic Resources Management: Rome, June 2016).

[51] Shaver, A. and Yozell, S., *Casting a Wider Net: The Security Implications of Illegal, Unreported, and Unregulated Fishing* (Stimson Center: Washington, DC, Jan. 2018); and Belhabib, D., Sumaila, U. R. and Le Billon, P., 'The fisheries of Africa: Exploitation, policy, and maritime security trends', *Marine Policy*, vol. 101 (Mar. 2019).

[52] Mendenhall et al. (note 43); and Spijkers et al. (note 44).

[53] Liddick, D., 'The dimensions of a transnational crime problem: The case of IUU fishing', *Trends in Organized Crime*, vol. 17, no. 4 (Dec. 2014); Mackay, M., Hardesty, B. D. and Wilcox, C., 'The intersection between illegal fishing, crimes at sea, and social well-being', *Frontiers in Marine Science*, vol. 7 (12 Oct. 2020); Desai, R. M. and Shambaugh, G. E., 'Measuring the global impact of destructive and illegal fishing on maritime piracy: A spatial analysis', *PLOS ONE*, vol. 16, no. 2 (24 Feb. 2021); and Denton, G. L. and Harris, J. R., 'The impact of illegal fishing on maritime piracy: Evidence from West Africa', *Studies in Conflict & Terrorism*, vol. 44, no. 11 (2 Nov. 2021).

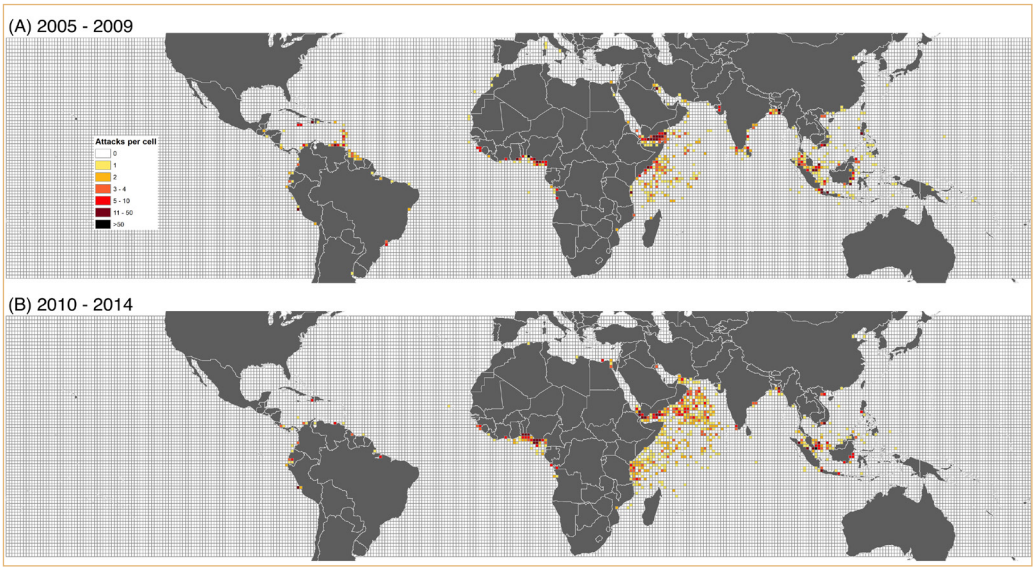

Figure 6.4A. Maritime piracy, 2005–14

Piracy incidents from the consolidated ASAM-GISIS database, overlaid with a 1* x 1* gridded-cell layer.

Source: Desai, R. M. and Shambaugh, G. E., 'Measuring the global impact of destructive and illegal fishing on maritime piracy: A spatial analysis', *PLOS ONE*, vol. 16, no. 2 (24 Feb. 2021).

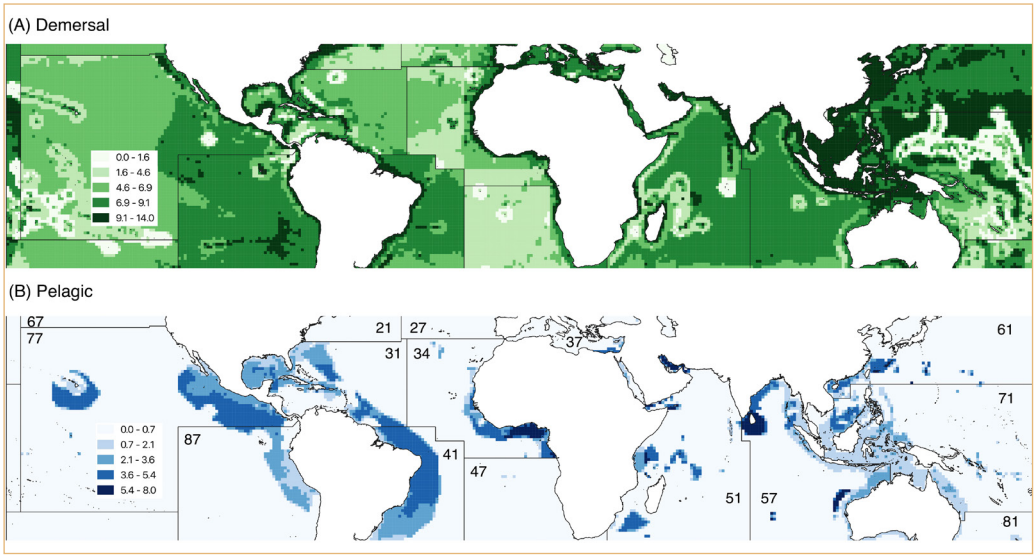

Figure 6.4B. High bycatch and destructive fishing, 2005–14

Estimated total catch, 2005–14, metric tonnes per degree cell (Ln), by taxonomic group. Food and Agriculture Organization of the United Nations major fishing areas are labelled in panel B.

Source: Desai, R. M. and Shambaugh, G. E., 'Measuring the global impact of destructive and illegal fishing on maritime piracy: A spatial analysis', *PLOS ONE*, vol. 16, no. 2 (24 Feb. 2021).

precipitated by resource depletion by foreign fishing vessels offshore have in fact spurred and perpetuated the instabilities and state fragility on land.[54]

[54] Weldemichael, A. T., *Piracy in Somalia: Violence and Development in the Horn of Africa* (Cambridge University Press: Cambridge, 2019); Glaser, S. M., Roberts, P. M. and Hurlburt, K. J., 'Foreign illegal, unreported, and unregulated fishing in Somali waters perpetuates conflict', *Frontiers in Marine Science*, vol. 6 (6 Dec. 2019); and Okafor-Yarwood, I., 'The cyclical nature of maritime security threats: Illegal, unreported, and unregulated fishing as a threat to human and national security in the Gulf of Guinea', *African Security*, vol. 13, no. 2 (2 Apr. 2020).

Seabed mining

The deep seabed—the sea floor below 200 meters depth—contains considerable mineral resources. The Clarion-Clipperton Zone alone, an area in the eastern Pacific the size of Europe, is estimated to hold more nickel, manganese, and cobalt than all land-based reserves combined.[55] These and other significant seabed metals such as lithium, zinc, and rare earth elements figure among the so-called 'critical minerals' essential to advancing green technologies and achieving the clean energy transition.[56] Improving undersea exploitation techniques render seabed deposits increasingly accessible, raising prospects of a marine 'Klondike gold rush', as countries and companies scramble to conquer mineral development's 'last frontier'.[57]

Deep-sea mineral deposits occur in several different forms, known as cobalt-rich crusts, polymetallic nodules, and polymetallic sulphides, and are distributed widely throughout the world's oceans. Advocates affirm that deep seabed mining (DSM) will deliver high-grade ores with fewer social and environmental impacts than terrestrial mining.[58] Because substantial deposits lie within the EEZs of small island states, proponents argue DSM could supply many SIDS with needed resource revenues.[59] At the same time, many policymakers and policy analysts maintain that DSM can help alleviate 'security of supply' risks surrounding the growing demand for critical minerals. Retrieving critical minerals from the sea floor would diversify sourcing and thus reduce reliance on production concentrations in China and some fragile states.[60]

Yet, at present, DSM's promise remains prospective. And contested. In practice, deep seabed mining may prove neither economically viable nor environmentally sustainable. Economically, projected long-term demands for critical minerals are highly uncertain, depending upon rapidly evolving technology pathways and could largely be met without mining the seabed.[61] DSM operations could also conflict with established commercially valuable assets, including fisheries, marine protected areas, shipping lanes, and submarine cables and telecoms terminals.[62] Environmentally, DSM poses severe risks. DSM could decimate fragile deep sea marine fauna, damage important habitats, stir up toxic sediments, and generate harmful wastes.[63] Reflecting these challenges, several SIDS support a 10-year moratorium on DSM to allow for further research.[64]

The geopolitical issues frequently invoked around deep-sea minerals are also complex.[65] Some analysts consider that DSM ambitions are already spawning international tensions in the Indian Ocean, South China Sea, and elsewhere, as major powers jockey to control undersea critical minerals.[66] But the global picture is variegated. National authorities are responsible for regulating DSM within their EEZs. The UN Convention on the Law of the Sea established the International Seabed Authority (ISA) to manage mineral resources activities in areas beyond national jurisdiction 'for the benefit of mankind as a whole'.[67] Even so, national and international

[55] Lusty, P. A. J. and Murton, B. J., 'Deep-ocean mineral deposits: Metal resources and windows into earth processes', *Elements*, vol. 14, no. 5 (1 Oct. 2018), p. 304; and Levin, L. A., Amon, D. J. and Lily, H., 'Challenges to the sustainability of deep-seabed mining', *Nature Sustainability*, vol. 3, no. 10 (Oct. 2020), p. 1.

[56] International Energy Agency (IEA), *The Role of Critical Minerals in Clean Energy Transitions* (IEA: Paris, May 2021).

[57] Santos, M. M. et al., 'The last frontier: Coupling technological developments with scientific challenges to improve hazard assessment of deep-sea mining', *Science of The Total Environment*, vol. 627 (June 2018); and Hallgren, A. and Hansson, A., 'Conflicting narratives of deep sea mining', *Sustainability*, vol. 13, no. 9 (8 May 2021), p. 1.

[58] Hallgren and Hansson (note 57); and Lèbre, É. et al., 'The social and environmental complexities of extracting energy transition metals', *Nature Communications*, vol. 11, no. 1 (Dec. 2020).

[59] D'Arcy, P., 'The nourishing sea: Partnered guardianship of fishery and seabed mineral resources for the economic viability of small Pacific Island nations', *Sustainability*, vol. 5, no. 8 (6 Aug. 2013); and Petersen, S. et al., 'News from the seabed: Geological characteristics and resource potential of deep-sea mineral resources', *Marine Policy*, vol. 70 (Aug. 2016).

[60] Burke, S. and Zimmerman, R. *The Global Race for Critical Minerals in the Deep Ocean* (New America Foundation: Washington, DC, Aug. 2019); Childs, J., 'Extraction in four dimensions: time, space and the emerging geo(-)politics of deep-sea mining', *Geopolitics*, vol. 25, no. 1 (1 Jan. 2020); and Toro, N., Robles, P. and Jeldres, R. I., 'Seabed mineral resources, an alternative for the future of renewable energy: A critical review', *Ore Geology Reviews*, vol. 126 (Nov. 2020).

[61] Miller, K. A. et al., 'Challenging the need for deep seabed mining from the perspective of metal demand, biodiversity, ecosystems services, and benefit sharing', *Frontiers in Marine Science*, vol. 8 (29 July 2021).

[62] Levin, Amon and Lily (note 55); and Kung, A. et al., 'Governing deep sea mining in the face of uncertainty', *Journal of Environmental Management*, vol. 279 (Feb. 2021).

[63] Leal Filho, W. et al., 'Deep seabed mining: A note on some potentials and risks to the sustainable mineral extraction from the oceans', *Journal of Marine Science and Engineering*, vol. 9, no. 5 (12 May 2021); and Kaikkonen, L. et al., 'Causal approach to determining the environmental risks of seabed mining', *Environmental Science & Technology*, vol. 55, no. 13 (6 July 2021).

[64] Kung et al. (note 62), p. 2.

[65] Childs (note 60).

[66] Agarwala, N., 'Advances by China in deep seabed mining and its security implications for India', *Australian Journal of Maritime & Ocean Affairs*, vol. 13, no. 2 (3 Apr. 2021); and Crescenzi, M. and Gent, S. 'China's deep-sea motivation for claiming sovereignty over the South China Sea', The Diplomat, 6 May 2021).

[67] United Nations Convention on the Law of the Sea, 1982 Part XI, Section 2, Article 140.

DSM policy architectures remain in their infancy. The ISA has concluded 30 exploration contracts since 2001. A handful of countries have issued exploration licenses within their EEZs.[68] But the one actual commercial mining operation to receive approval collapsed in 2019 in the face of civic opposition and financial difficulties. There are currently no fully active commercial DSM projects.[69] Rather than becoming an incipient resource bonanza or an impending great power confrontation, DSM now appears clouded in economic, environmental and regulatory uncertainty.[70] Whether and how any deep-sea mineral gold rush will pan out remains to be seen.

[68] Levin, Amon and Lily (note 55), p. 1, 3.
[69] Kung et al. (note 62), p. 1.
[70] Levin, Amon and Lily (note 55); Kung et al. (note 62); and Leal Filho et al. (note 63).

7. Fiji, Kiribati and Pacific SIDS

Caleb Ray and Jimaima Lako

Introduction

The Pacific small island developing states (Pacific SIDS) of Oceania are some of the most vulnerable countries in the world to climate change.[1] They are faced with both long-term risks, such as sea-level rise, and short-term risks in the form of extreme whether events (cyclones).[2] When combined, these threats are existential. They have the potential to make human life impossible for many populations and even entire countries in the region. While the preference for Oceania residents is to remain in their homeland, Islanders, especially younger and middle generations, generally recognise the risk climate change poses to their homes and are beginning to imagine the possibility of climate-induced migration.[3]

Regional context

Oceania consists of small islands spread out over vast distances in the Pacific Ocean, and the region is home to approximately 8.2 million people, included the 5.2 million people in Papua New Guinea (see figure 7.1).[4]

Economically, Pacific SIDS rely heavily on outside assistance, receiving more development assistance per capita than any other region in the world.[5] Due to their heavy reliance on aid, Pacific SIDS generally lack the resources or capacity to prepare for, manage, and recover from climate-related disasters.

Oceania's islands face different climate-related risks based on their geography. Countries like Kiribati, Marshall Islands, Tonga, and Tuvalu, which are generally comprised of low-lying islands face the most immediate existential risks.[6] Given their low-elevation, rising sea level and resultant rising tides, along with severe weather events, threaten to completely inundate them.[7] Countries with high volcanic origins, like Fiji and Vanuatu, still face existential threats to their coastlines and river banks, but have highland areas to which islands residents can retreat.[8] However, Fiji and other high islands are more prone to flash flooding, as rain falls on their mountainous interiors and gathers in rivers on the way to the coast, potentially resulting in erosion and landslides.[9]

A number of Pacific SIDS have international ties that make their populations less vulnerable to existential risk. For example, Marshallese have the right to live and work in the United States under the Compact of Free Association (CFA).[10] The Federated States of Micronesia and Palau

[1] Organisation for Economic Co-operation and Development (OECD), 'Small Island Developing States: SIDS', accessed 10 Dec. 2021.

[2] Walsh, K. J. E., McInnes, K. L., McBride, J. L., 'Climate change impacts on tropical cyclones and extreme sea levels in the South Pacific: A regional assessment', *Global and Planetary Change*, vol. 80–81 (2012).

[3] Hermann, E. and Kempf, W., 'Uncertain futures of belonging: Consequences of climate change and sea-level rise in Oceania', Epilogue, eds E. Hermann, W. Kempf and T. van Meijl, *Belonging in Oceania: Movement, Place-making and Multiple Identifications* (Berghahn Books: 2014); and Farbotko, C., Stratford, E. and Lazarus, H., 'Climate migrants and new identities? The geopolitics of embracing or rejecting mobility', *Social & Cultural Geography*, vol. 17, no. 4 (June 2016).

[4] Bell J. et al., *Climate Change and Pacific Island Food Systems: The Future of Food, Farming and Fishing in the Pacific Islands Under a Changing Climate* (Consultative Group on International Agricultural Research, CGIAR, Research Program on Climate Change, Agriculture and Food Security, CCAFS: Copenhagen and Wageningen, 2016); and Andrew, N. et al., 'Coastal proximity of populations in 22 Pacific Island Countries and Territories', PLOS ONE, vol. 14, no. 9 (Sep. 2019).

[5] Dornan, M. and Pryke, J., 'Foreign aid to the Pacific: Trends and developments in the twenty-first century', *Asia & the Pacific Policy Studies*, vol. 3, no. 4 (Sep. 2017).

[6] Nurse, L. et al., 'Small islands', eds V. R. Barros et al., *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press: Cambridge and New York, 2014).

[7] Nurse et al. (note 6).

[8] Mimura, N., 'Vulnerability of island countries in the South Pacific to sea level rise and climate change', *Climate Research*, vol. 12, no. 2–3 (1999).

[9] Mimura (note 8).

[10] Constable, A., 'Climate change and migration in the Pacific: Options for Tuvalu and the Marshall Islands', *Regional Environmental Change*, vol. 17 (2017).

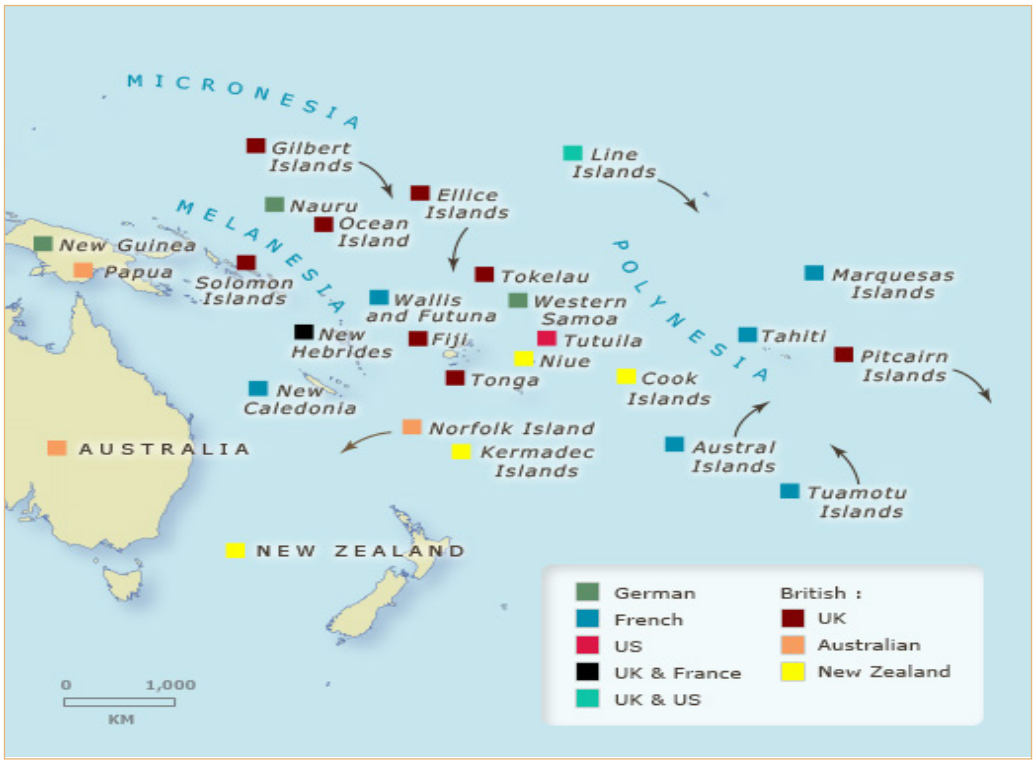

Figure 7.1. Oceania and the Pacific small island developing states

Source: Fraenkel, J., 'Pacific Islands and New Zealand: New Zealand and the Pacific', Te Ara: The Encyclopedia of New Zealand, [n.d.].

also have CFAs with the United States and Cook Islands, and Niue have a similar agreement with New Zealand.[11] Additionally, some polities in Oceania are dependencies, which can increase their access to outside resources and makes them more reliant on extra-regional aid. Examples include Guam (United States territory), French Polynesia and New Caledonia (French territories), and Tokelau (New Zealand dependent territory).[12]

Vulnerability also varies among and within countries based on local economic and social context. For example, Kiribati and the Marshall Islands are highly dependent on fisheries for food security and livelihoods. Adaptation options can also be shaped by local cultures and practices. For many, climate adaptation is not as easy as simply relocating. In Fiji, land tenure is complicated by longstanding political and social relations that customary landowners have with the land.[13] Additionally, Fijians of Indian descent, who account for 37.5 per cent of the total population in 2007, the second largest ethnic group in Fiji, are some of the poorest in the country and have few land tenure rights.[14] Vulnerability to climate change, in Oceania and elsewhere is therefore the result of a complex set of geographic, social, political, and economic factors.[15]

[11] US Department of the Interior, Office of Insular Affairs, 'Compacts of free association', accessed 3 June 2021; and Dumieński, Z., 'Shared citizenship and sovereignty: The case of the Cook Islands' and Niue's relationship with New Zealand', ed. S. Retuva, *The Palgrave Handbook of Ethnicity* (Palgrave Macmillan: Singapore, 2019), pp. 221–46.

[12] US Department of Interior, Office of Insular Affairs, 'Guam', accessed 14 June 2021; French Territorial Collectivities, 'Collectivités d'outre-mer' [Overseas collectivities], accessed 11 June 2021; and Government of Tokelau, 'Tokelau Government', accessed 11 June 2021.

[13] Gharbaoui, D. and Blocher, J., 'The reason land matters: Relocation as adaptation to climate change in Fiji islands', eds A. Milan et al., *Migration, Risk Management and Climate Change: Evidence and Policy Responses* (Springer International Publishing: Cham, 2016).

[14] Naidu, V., *Fiji: The Challenges and Opportunities of Diversity* (Minority Rights Group International: 2013); and Mangubhai, S. et al., 'Politics of vulnerability: Impacts of COVID-19 and Cyclone Harold on Indo-Fijians engaged in small-scale fisheries', *Environmental Science & Policy*, vol. 120 (June 2021).

[15] Ribot, J., 'Vulnerability does not fall from the sky: Toward multiscale, pro-poor climate policy', eds R. Mearns and A. Norton, *Social Dimensions of Climate Change* (World Bank: Washington, DC, 2010).

Climate Change and Security in Fiji

Flooding

According to Dr. Jimaima Lako, a Fijian resident and professor at Fiji National University working on climate resilience, flooding related to climate change is a major threat to human security in Fiji. Approximately 95 per cent of Fijians live on Viti Levu or Vanua Levu, Fiji's two largest islands.[16] Both Viti Levu and Vanua Levu are high, volcanic islands with mountainous, elevated interiors, which makes rising seas, high tides, or heavy rainfall unlikely to inundate either island.[17] However, 75 per cent of Viti Levu and Vanua Levu residents live on the coast, either in Fiji's capital city, Suva, or in smaller urban areas.[18] Additionally, the deterioration and destruction of mangrove forests and coral reefs has increased the vulnerability to climate change in coastal towns like Suva.[19]

Coastal and riverbank flooding can happen as the result of several different factors. Heavy rainfall and extreme tidal events are both becoming more common as climate change alters normal weather patterns.[20] Rising sea levels exacerbate the risk of flooding and inundation from extreme weather events. Communities already suffer from decreased access to fresh water and decreased food security due to contaminated surface and groundwater. As a result, not only do flood waters from extreme events contaminate fresh water supplies but saline intrusion from gradual sea level rise also ruins existing crops and diminishes the quality of agricultural land. Flooding also results in the increased spread of disease including mosquito- and water borne illnesses. Combined, these consequences of flooding threaten to make coastal communities on Viti Levu and Vanua Levu uninhabitable.

In a world first, Fiji launched the Climate Relocation and Displaced Peoples Trust Fund for Communities and Infrastructure in September 2019 to help fund the relocation of Fijian communities vulnerable to climate change.[21] The fund aims to take into account the issues, both economic and social, in relocating, and notes that it will focus on rebuilding communities and creating a new sense of belonging to help the transition. At least 45 Fijian communities will need to be relocated in the near future, and an explicit purpose of the fund is to provide a direct, effective avenue for the international community to fund those relocation efforts.[22] Fiji seeded the fund with an estimated $5 million annual contribution from its Environmental and Climate Adaption Levy, with help from Norway and New Zealand.[23] To date, five communities have moved and another 42 have applied for government support to start their relocation process.[24]

Disasters

Sudden-onset disasters like cyclones are also a major issue in Fiji. For example, Cyclone Winston struck Fiji at a record-breaking intensity in February 2016, killing 44 people, affecting 540 000 people (62 per cent of Fiji's population), and causing an estimated $1.42 billion in damages—equivalent to 31 per cent of Fiji's GDP.[25] In advance of Winston, Fiji opened storm shelters across the country and instituted a national curfew.[26] Afterwards, Fiji required at least $100 million in international aid—from the Asian Development Bank and the World Bank—to help residents recover from the storm.[27] There are both direct and indirect consequences of disasters which

[16] Fijian Bureau of Statistics, '2017 Population and Housing Census, Release 1', Press release, 5 Jan. 2018.
[17] Food and Agriculture Organization of the United Nations (FAO), *Country Profile: Fiji* (FAO: Rome, 2016).
[18] Andrew, N. et al. (note 4).
[19] Agrawala, S. et al., *Development and Climate Change in Fiji: Focus on Coastal Mangroves* (Organisation for Economic Co-operation and Development: Paris, 2003).
[20] Bindoff, N. L. et al., 'Observations: oceanic climate change and sea level', eds S. Solomon et al., *Climate Change 2007: The Physical Science Basis: Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press: Cambridge and New York, 2007).
[21] Permanent Mission of Fiji to the United Nations, 'World's first-ever relocation trust fund for people displaced by climate change launched by Fijian Prime Minister', 25 Sep. 2019.
[22] Permanent Mission of Fiji to the United Nations (note 21).
[23] Permanent Mission of Fiji to the United Nations (note 21).
[24] 'New Zealand makes first donation to Fiji climate relocation fund', Reuters, 27 Feb. 2020.
[25] Asian Development Bank, 'Emergency assistance for recovery from Tropical Cyclone Winston: Report and recommendation of the President to the Board of Directors', June 2016.
[26] Asian Development Bank (note 25).
[27] Asian Development Bank (note 25).

need to be addressed. From the contamination of food and water and the increased risk of disease spread from mosquitos, to issues of domestic- and gender-based violence.[28]

Climate change and security in Kiribati

Unlike Fiji, countries comprised of small, low-lying islands, such as Kiribati, Tonga, and Tuvalu, have nowhere to retreat from coastal flooding. While complete inundation is a real threat to human life on other low-lying islands, rising seas are likely to contaminate freshwater resources and make survival difficult long before they disappear beneath the sea.[29] This saltwater intrusion is already an issue in Kiribati, where many wells can no longer supply clean water.[30]

In response to this existential threat, Anote Tong, Kiribati's president from 2003 to 2016, developed the concept of Migration with Dignity.[31] Migration with Dignity was intended to help i-Kiribati develop knowledge, skills, and professional qualifications to enable them to find work in other countries.[32] While Tong was clear that relocation because Kiribati could 'no longer sustain human life' was a worst-case scenario, his administration wanted to prevent i-Kiribati from becoming second-class citizens in their new homes if they did relocate.[33]

In 2014, the Kiribati government also secured land in Fiji suitable for agricultural and economic development.[34] The 5500-acre Natoavatu Estate—a freehold property that is a rarity in Fiji, where much of the land tenure is customary and unavailable to foreigners—was purchased for $8.77 million.[35] Tong did not connect the purchase to Migration with Dignity. Instead, he said the government purchased the land 'to address the issue of food security and to promote long-term development goals'.[36] Many i-Kiribati made the connection themselves, however. They 'associated the purchase with the possibility of future migration to Fiji' if their low-lying islands become uninhabitable, which could happen as soon as 2050.[37]

Migration with Dignity and the spectre of relocation to Fiji, however, has been unpopular with Kiribati citizens, who have expressed concern over how they will be perceived by the host population. New migrants tend to rely on family connections, community groups, and other social supports as a safety net and for a network, but this is highly difficult for the 'first generation' Kiribati migrants, meaning that many Kiribati citizens would prefer to stay.[38]

Tong's party lost the 2016 election to Taneti Maamau and the Tobwaan Kiribati Party.[39] Rejecting Migration with Dignity and 'the misleading and pessimistic scenario of a sinking/deserted nation' was central to Maamau's campaign.[40] Kiribati has continued with Tong's stated plans for the Fijian land, however, where Maamau's government plans to use it grow food and train i-Kiribati in climate-resilient agricultural techniques.[41] By providing a secure source of food, the land in Fiji will, in theory, help those living on Kiribati's low-lying islands to stay there even after climate change makes agricultural livelihoods impossible.

Partnership and external actors in Oceania

As can be seen from these examples, the severity and extent of climate-related threats varies based on specific island contexts, but the general nature of the hazards overlap significantly. Climate

[28] Esler, S. et al., *Fiji: Post-Disaster Needs Assessment* (Government of Fiji: Suva, May 2016).

[29] Oberle, F., Swarzenski, P. and Storlazzi, C., 'Atoll groundwater movement and its response to climatic and sea-level fluctuations', *Water*, vol. 9, no. 9 (30 Aug. 2017).

[30] Republic of Kiribati, 'Fresh water supply', accessed 3 June 2021; and Tong, A., 'Statement by HE President Anote Tong', Speech at the Third International Conference on SIDS, Apia, Samoa, 2 Sep. 2014.

[31] Hermann, E. and Kempf, W., 'Climate change and the imagining of migration: emerging discourses on Kiribati's land purchase in Fiji', *Contemporary Pacific*, vol. 29, no. 2 (2017).

[32] Hermann and Kempf (note 31).

[33] Hermann and Kempf (note 31); Tong (note 30).

[34] Hermann and Kempf (note 31).

[35] Ellsmoor, J. and Rosen, Z., 'Kiribati's land purchase in Fiji: Does it make sense?' Devpolicy Blog, accessed 13 Dec. 2021.

[36] Tong (note 30).

[37] Hermann and Kempf (note 31); and Nurse et al. (note 6).

[38] Maekawa, M. et al., 'Livelihood re-establishment of emigrants from Kiribati in Fiji', *Journal of Disaster Research*, vol. 14, no. 9 (2019).

[39] Government of Kiribati, Office of Te Beretitenti, 'The President', accessed 3 June 2021.

[40] Maamau, T., 'His excellency Beretitenti Taneti Maamau's statement', Speech at the Leaders Event of COP 23, Bonn, Germany, 15 Nov. 2017.

[41] Pala, C., 'Kiribati and China to develop former climate-refuge land in Fiji', *The Guardian*, Feb. 23, 2021.

change, both in the short and long-term, threatens life on every island in Oceania. Oceanic islands also share the food, water, and human security issues that flow from climate change, including existential crises on all or parts of each island.

To address their shared struggle with climate change, Oceania's polities cooperate in several international forums. The Pacific Islands Forum (PIF) is the region's main forum for policy cooperation. It has 18 regional members and focuses on 'peace, harmony, security, social inclusion and prosperity, so that all Pacific people can lead free, healthy, and productive lives'.[42] PIF recognizes climate change as the single greatest threat to the region and has taken several steps to manage and address climate-related risks in Oceania. This includes the 2016 Framework for Resilient Development in the Pacific (FRDP), which takes an 'all-stakeholder approach . . . to enhance resilience to climate change and disasters, in ways that contribute to and are embedded in sustainable development'.[43]

PIF created the FRDP with regional partners, including the Pacific Community (SPC, formerly the South Pacific Commission), which is the principal scientific and technical organisation in the region;[44] the Secretariat of the Pacific Regional Environmental Programme (SPREP), which focuses on sustainable development and managing and protecting the region's environment and natural resources;[45] the UNDP, and the University of the South Pacific (USP).[46] Other international organizations (USAID, World Bank, Asian Development Bank, and the EU) and extra-regional states (Australia and Sweden) assisted PIF and its partners with the FRDP.

PIF, SPREP, and SPC established the Pacific Resilience Partnership (PRP) in 2017 to help implement FRDP's guidance throughout Oceania.[47] The PRP has three goals: (*a*) Strengthened integrated adaptation and risk reduction to enhance resilience to climate change and disasters; (*b*) Low carbon development, and (*c*) Strengthened disaster preparedness, response, and recovery.[48] The participating states each have a framework to implement a state-level climate plan to address the partnership's goals.[49] Every three years, the PRP and individual partner states will assess the results of their implementation and adjust their frameworks, in cooperation with and using lessons learned from states across the PRP.[50] PIF also facilitates collaboration through its Council of Regional Organizations of the Pacific, which includes SPREP, SPC, and USP and which allows agencies to share their achievements via annual reports.[51] While it is too early to assess the success of the PRP—the first round of development ends in 2021[52]—it promises to help Oceania reduce the impact of climate change through collective action.

Extra-regional actors, including multilateral organisations, non-governmental organisations, and specific states, also play a key role in addressing the effects of climate change in Oceania. Specifically, international actors are essential to fund climate resilience projects, which are too expensive for Oceanic states to implement themselves at the necessary scale. Engagement with China has increased recently due to belief that they have the resources required to help Pacific island nations mitigate and manage the impacts of climate change and fully implement the Paris Agreement.[53]

Concerns, however, have been raised over the ability of international actors to fully support Pacific SIDs. The amount of money necessary to adapt to and address the consequences of climate change in Oceania is immense. Since 1970 it is estimated that SIDS have lost $153 million to climate-related events. As a result, many also struggle with exceedingly high debt-to-GDP ratios, threatening their capacity to withstand these compounding crises.[54] ODA has been faulted for being insufficient to cover the necessary climate change mitigation and adaption costs within

[42] Pacific Islands Forum, 'The Pacific Islands Forum', accessed 3 June 2021.

[43] Pacific Community, *Framework for Resilient Development in the Pacific: An Integrated Approach to Address Climate Change and Disaster Risk Management (FRDP) 2017-2030* (Pacific Community: Suva, 2016).

[44] Pacific Community, 'About us', accessed 6 Mar. 2021.

[45] Secretariat of the Pacific Regional Environmental Programme, 'About us', accessed 3 June 2021.

[46] Pacific Community (note 43).

[47] Pacific Islands Forum, 'FDRP & pacific resilience partnership', accessed 3 June 2021; and Pacific Resilience Partnership, 'Pacific resilience partnership' accessed 4 June 2021.

[48] Pacific Resilience Partnership, 'Resilient development in the Pacific', accessed 3 June 2021.

[49] Pacific Community (note 43).

[50] Pacific Community (note 43).

[51] Council of Regional Organisations of the Pacific, *Council of Regional Organisations of the Pacific Charter* (Council of Regional Organisations of the Pacific: 2018).

[52] Pacific Resilience Partnership (note 48).

[53] 'Some Pacific Island nations are turning to China. Climate change is a factor', NPR, accessed 13 Dec. 2021.

[54] Meddeb, R., 'Small island developing states do not have the luxury of time', United Nations Development Programme (UNDP), accessed 13 Dec. 2021.

the Pacific SIDs, and the ability of private investment to address the remaining financing gap has also been criticised. Additionally, while the threats are regional, each state and territory in Oceania must address them at the community level, which takes time, knowledge, money, and community buy-in. Extra-regional actors can provide money, knowledge and technical advice. They can also work with community committees to facilitate community buy-in and ownership of climate resilience projects, although the process is slow.

Conclusion

Climate change is an existential crisis in Oceania, which looms as an ultimate threat to security in the region. Oceanic countries have raised the issue at the UN Security Council, but it has failed to gain traction, perhaps because some countries see the risks to Oceania as a climate adaptation issue rather than a threat to international peace and security. But the longer-term existential threat looms larger, which the international community must acknowledge.

The international community also has an obligation to help Oceania deal with climate-related threats. Given that the first preference of islanders is to stay in their home countries, this help should come in the form of international aid and technical expertise to help Pacific island nations adapt and make their communities and islands more resilient. At the same time, neighbours will likely be called upon to have more flexible visa and work programmes so that people from Pacific SIDS can more easily migrate, earn an income, and re-invest in their communities. The sooner the international community recognises the existential threat climate change poses to human life in Oceania, the more it can help Oceania's Pacific SIDS prepare for and manage the consequences.

8. Farmer–Herder Violence: West Africa/Sahel

Corey Pattison

Pastoralism is an important economic, social, and cultural aspect of life in the Sahel. Livestock production accounts for at least 25 per cent of the GDP of Sahelian countries[1] and 40 per cent of agricultural GDP in the Sahel region.[2] Transhumant pastoralism—the migration of pastoralists and their herds between seasonal pastures, often across national borders—is an important part of this practice, representing between 70 and 90 per cent of the cattle population in the Sahel.[3]

Yet, in recent years, this way of life has faced growing threats due to climate change, political instability, and broader economic shifts that have transformed the rangelands in which pastoralists live and work. In particular, pastoral production is highly vulnerable to environmental change since herders depend on rainfall to sustain grazing grounds, which fluctuate in size according to the amount of annual rainfall. In recent years the frequency of drought has increased dramatically in the Sahel, from an average of once every 12.5 years between 1982 and 2006 to once every 2.5 years between 2007 and 2016.[4] These droughts have also become more severe and prolonged, diminishing the productive capacity of the land. As a consequence, pastoral communities are increasingly vulnerable to malnutrition and food insecurity, as their capacity to adapt to, and recover from, crises declines in the face of recurrent and often overlapping shocks.[5] And these trends are expected to worsen because of climate change, with projections that both drought as well as widespread flooding may become more frequent in the coming decades.[6]

In addition to increasing vulnerability, changes to pastoral areas are also impacting relationships between pastoralists and sedentary rural communities, with whom they have historically shared landscapes and resources. Violent clashes between these groups have increased in recent years to such an extent that roughly a third of all battle-related fatalities in Africa over the 1997–2014 period (30.6 per cent) involved conflict between pastoralists and farmers.[7] The outsized impact of farmer–herder conflict can also be seen in the geographic distribution of violent conflict in Africa, shown in figure 8.1, which illustrates the high incidence of conflict in transitional areas with areas of mixed agropastoralism and agriculture.

A leading explanation for the rise in conflict in these areas is that the variability of rainfall is forcing nomadic groups to move beyond the borders of their traditional grazing lands, thereby infringing on territories of other groups practicing agriculture.[8] Since pastoral livelihoods are often closely linked with culture and identity, ethnic and religious divisions between pastoralist groups and others are sometimes used to further justify this thinking.[9] A growing body of evidence does indeed provide support for the view that climate change can influence pastoralism-related conflict dynamics by affecting the distribution of water and grazing resources.[10] Importantly, however, this literature also nuances this view, noting that changing patterns of livestock movement are not inherently a response to scarcity but also to relative abundance, and that conflict,

[1] Defined here as the G5 Sahel countries of Burkina Faso, Chad, Mali, Mauritania and Niger.

[2] de Haan, C., *Estimating Livestock Dependent Populations in Mali: Methodological Note* (World Bank: Washington, DC, 2014).

[3] Kamuanga, M. et al., *Livestock and Regional Market in the Sahel and West Africa: Potentials and Challenges* (Sahel and West Africa Club/Organisation for Economic Co-operation and Development, OECD: Paris, 2008).

[4] Bamba Sylla, M. et al., 'Projected heat stress under 1.5°C and 2°C global warming scenarios creates unprecedented discomfort for humans in West Africa', *Earth's Future*, vol. 6, no. 7 (July 2018).

[5] Food and Agriculture Organization of the United Nations (FAO), *Pastoralism in Africa's Drylands* (FAO: Rome, 2018).

[6] Busby, J., Cook, K. and Vizy, E., 'Identifying hotspots of security vulnerability associated with climate change in Africa', *Climate Change*, vol. 124, no. 4 (2014).

[7] Eberle, U. J., Rohner, D. and Thoenig, M., *Heat and Hate: Climate Security and Farmer-Herder Conflicts in Africa*, Working Paper no. 22 (Empirical Studies of Conflict, ESOC: Princeton, NJ, Dec. 2020).

[8] Turner, M. D., 'Political ecology and the moral dimensions of "resource conflicts": The case of farmer-herder conflicts in the Sahel', *Political Geography*, vol. 23, no. 7 (Sep. 2004), pp. 863–89.

[9] Brottem, L. and McDonnell, A., *Pastoralism and Conflict in the Sudano-Sahel: A review of the literature* (Search for Common Ground: Washington, DC, 2020).

[10] Brottem and McDonnell (note 9).

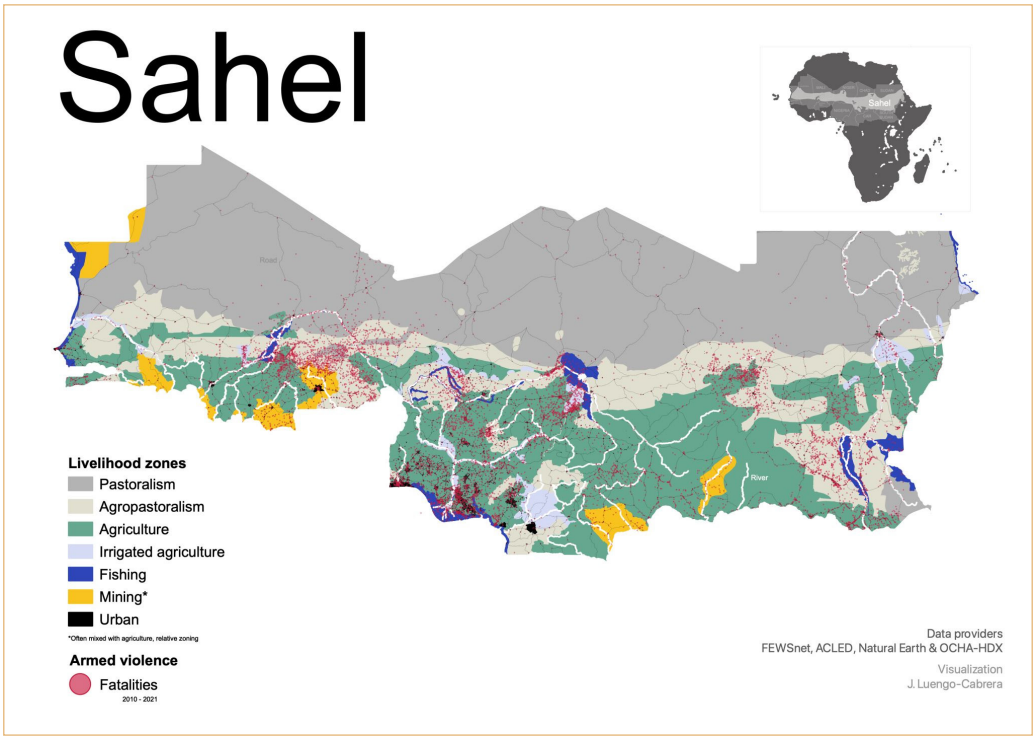

Figure 8.1. Geographic distribution of violent conflict and livelihood groups in the Sahel, 2010–21

Source: @J_LuengoCabrera, 'Sahel: intercommunal violence & livelihood zones', Twitter, 3 Jan. 2022.

when it occurs, is primarily a result of poor governance; particularly, the lack of credible actors or institutions to mediate and manage increasing competition over resources.[11]

The explanatory picture which emerges then is considerably more complex, including also agricultural expansion and associated land policies, local governance, and national policies that increasingly restrict the mobility of pastoral communities.[12] And these are, themselves, a reflection of broader economic and social trends in the region, including privatization of land, sedentarization and livelihood diversification—trends that are both a cause and consequence of a changing natural environment—that are reshaping the balance between crop and livestock production and the relationships between pastoralists and farmers. In the Sahel, cropland has increased 2.5-fold to the detriment of critical grazing areas, which have decreased by 13 per cent. In parallel, the livestock population increased 2.5-fold between 1961 and 2009, leading to increased competition for grazing land, particularly during the dry season.[13] The need to move through insecure spaces or to access resources through secondary rights adds yet further dimensions of economic and political vulnerability for pastoralists, which has been exploited by both corrupt or abusive authorities and non-state armed groups.[14]

In this context, development interventions seeking to support pastoralism have had mixed results, historically, in part because they have lacked comprehension of the interlinked drivers of vulnerability mentioned above. The earliest experiments from the 1960s to 1980s involved the transfer of Western ranching technology to parastatal ranches in Botswana, Kenya and Yemen and suffered from government-controlled marketing monopolies and livestock prices. A decade later projects in Somalia, Senegal, Kenya and Botswana funded communal infrastructure—water, roads and markets—in tandem with promoting grazing and land rights adjudication. Yet these projects also were largely unsuccessful because of inflexible grazing rights and weak regional

[11] Brottem and McDonnell (note 9).

[12] de Haan, C. (ed.), *Prospects for Livestock-based Livelihoods in Africa's Drylands* (World Bank: Washington, DC, 2016); and ECliS, *Contribution of Livestock Systems to the Reduction of Rural Population Vulnerability and to the Promotion of Their Adaptability to Climate and Society Changes in West Sub-Saharan Africa (Senegal, Mali, Niger, Benin)* (French National Research Agency: Paris, 2012).

[13] de Haan, ed. (note 12).

[14] Brottem and McDonnell (note 9).

implementing institutions.[15] More recent development projects that assumed a direct correlation between resource scarcity and conflict have only provided new evidence that relative *abundance* can also be a source of conflict, as the provision of boreholes has in several cases led to overgrazing of dry season pastures by attracting permanent settlers who did not respect the resting period of these rangelands and prevented their regeneration.[16]

The failures of these early efforts thus weakened appetites for support to pastoralism by international donors by the early 2000s. But increasing droughts and severe climate events in the Horn of Africa in the early 2010s stimulated renewed investment and interest in innovative, holistic approaches to pastoral developments, based on learning from earlier experiences. Two large investment operations supported by the World Bank embody this new approach: first, the Regional Sahel Pastoralism Support Projects (PRAPS), which aims to protect pastoral systems by improving resource management and animal health, facilitating access to markets, and diversifying sources of income for pastoral households and managing conflicts. The second project is the Regional Pastoral Livelihood Resilience Project for the Horn of Africa (RPLRP), implemented by the governments of Kenya, Uganda, and Ethiopia with coordinating support from the Authority on Development (IGAD).

Renewed attention to supporting pastoralism occurred in parallel to a heightened focus on conflict sensitivity, greater transparency and accountability, and community-level implementation within the World Bank. The renewed attention to supporting pastoralism and greater awareness of the need to take account of conflict dynamics offered the opportunity to implement a conflict-prevention lens to the projects described above. Thus was born the Pastoralism and Stability in the Horn and in the Sahel (PASSHA) programme, which began in 2016 with a grant from the World Bank. The objective was to think critically about how to actively integrate peacebuilding components within a much larger development project to make the latter more sensitive to local and regional social and political dynamics. By emphasizing participation of all local stakeholders in programme design and implementation, the project also aimed to improve pastoralists' perception of the state by improving transparency, responsiveness, and accountability—thereby addressing grievances related to exclusion from formal institutions and processes, which were considered as a driver of the conflict.

From 2016–19, PASSHA provided targeted trainings and analysis to build a stabilization and conflict-prevention dimension into these two regional projects. A key part of this support sought to strengthen institutional capacity to assess conflict and provide early warning within the regional organizations that coordinated the projects, respectively (IGAD in the Horn and the Permanent Inter-State Committee for Drought Control in the Sahel (CILSS) in the Sahel). This covered geospatial analysis of conflict in cross-border areas, mapping of transhumance corridors, developing early warning software, and financing field monitors and mediation experts. PASSHA also funded both local cross-border and national level committees.

The PASSHA model of complementing large-scale development projects with peacebuilding components—rather than funding a standalone project with smaller funding—helped leverage significant financial resources to address farmer-herder conflict at scale. Between 2015 and 2020, PRAPS helped establish and improve the management of more than 5 million hectares of pastureland, 181 water points, and 66 cattle markets, while delineating 1414 km of transhumance corridors. Such scale has also aided in institutionalizing conflict management into efforts to support agriculture and pastoralism in the Sahel amongst national governments in the region. For example, the recently drafted National Strategies for Pastoral Waterworks (Strategie Nationale de l'Hydraulique Pastorale) of Mali, Niger, and Chad all recognize the contested nature of access to water and land between sedentary communities and pastoralists and propose guiding principles for the establishment of social agreements around the development, use, and management of water resources in pastoral areas.

A further $375m credit from the World Bank, announced in March 2021, will continue to support pastoralists' peaceful mobility along the local and cross-border mobility routes, and increase income through essential infrastructure established around water points, such as reception zones for the pastoral herders, pasture for the livestock, vaccination stations, livestock markets, fodder

[15] de Haan, C., *An Overview of the World Bank's Involvement in Pastoral Development*, Policy Paper (United Nations Sudano Sahelian Office: Paris, Dec. 1993).

[16] Pratt, D. J., Le Gall, F. and de Haan, C., *Investing in Pastoralism: Sustainable Natural Resource Use in Arid Africa and the Middle East*, Technical Paper (World Bank: Washington, DC, 1997).

storage warehouses, and shops managed by women. At the centre of this approach, building on insights from PASSHA, is facilitating multi-actor and multi-scale consultations to arrive at social agreements on the use of common resources among all parties—local actors, beneficiaries, administrative and customary authorities. Taken together with the foregoing analysis, this experience suggests that strategies for supporting pastoralism will be most successful when they are based on a mutually reinforcing programme of improving essential infrastructure together with enhancing the inclusiveness and participation of institutions to manage such collective infrastructure and the use of common resources.

9. Water and the Militias of Southern Iraq

Peter Schwartzstein

When militia recruiters came to the North Abu Zarag Marsh near Nasiriyah in southern Iraq in August of 2014, it didn't take them long to empty the surrounding villages of most of their young men. For weeks before, locals had watched in horror as the Islamic State group had surged across the country's north and west. And for those weeks, they had been electrified by religious clerics' call to arms against the jihadists. A good number of the community's most committed fighters had answered that appeal, dusting off old weapons and heading to the front. It wasn't, however, until the worst of the summer heat set in and water flow through the marsh fell to its lowest level in years that the real exodus began.

Haidar Salim, a buffalo farmer, signed on with the Badr Organization, one of the largest and most powerful of the militias. His income had all but disappeared as his animals' milk yields withered in the now shallow, knee-deep waters—some four meters lower than they can be. Then came his unemployed twin, Mohammed, later to die in a suicide bombing during the battle for Ramadi. The brothers were followed in quick succession by no fewer than 50 fishermen, each of whom had long since given up hope of making their nets bulge. Vendors at three marsh fish markets estimate that local catch has fallen by at least 50 per cent since 2003 due to low and excessively saline river flow. 'After the summer we were all women and old men and children here', said Sayyid Mehdi Sayyid Hashem, a community leader and overseer of an important local shrine. 'After the groups came through, the marsh went with them.'

In marching off to war, many of these men invoked their patriotism and piety—and they undoubtedly meant it. But with that diminished water flow in a community where almost every profession is dependent on the Tigris and Euphrates' irrigation of the marshlands, few could conceal the undercurrent of desperation. Bit by bit, water quantity—and quality—had deteriorated over the previous decade, plunging residents deeper into penury. Here at last was a chance to make at least something of a living. 'When you're hungry, when you have a family to feed, you'll do anything', said Salim. 'I didn't see myself as a fighter, but sometimes it's your only option.'

This is what environmental disaster can look like, and among crumbling parts of rural southern Iraq, it is directly fueling the militarization of society. Years of escalating climate and water woes have gutted agriculture, fishing, and buffalo breeding, the bedrocks of the countryside economy, just as the oil industry and public sector hiring have spluttered. Since the early 2000s, Iraq has been mired in varying degrees of water crisis, the worst of which has struck the country's far south, which receives little rain, boasts an extensive agrarian population, and stands at the end of the dirtied and drained rivers.[1] Amid conflict with the Islamic State (also known as IS or ISIS) and enduring insecurity since the jihadists' lost their last territory in Iraq in 2017, many of these newly jobless or underemployed villagers have come to form the basis of a new—and controversial—fighting force.[2]

Responses to environmental shocks vary enormously, of course, and there's much more to them than taking up arms. Some families have migrated to cities near and far, swelling the outskirts of Basra, Baghdad and Nasiriyah, among others. There, they've competed for day labour with longstanding residents, sometimes driving down wages and sparking resentment. Plenty have remained in place, adapting and even prospering on occasion. Many more have stumbled on with no other options. 'Every year, we pray to God for things to get better', said Jabar Musa al-Sharanbi, a buffalo farmer near Amarah. 'But they don't. Every year, we get poorer and poorer.'

There's significantly more to these groups than environmental disaster, too. Emerging, in most instances, as the hollowed out Iraqi army collapsed during the Islamic State's 2014 surge and in response to Grand Ayatollah al-Sistani's appeal to Iraqis to defend their homeland and holy sites,

[1] Human Rights Watch, *Basra Is Thirsty: Iraq's Failure to Manage the Water Crisis* (Human Rights Watch: New York, July 2019).
[2] Glenn, C. et al., 'Timeline: The rise, spread, and fall of the Islamic State', Wilson Center, 28 Oct. 2019.

the militias may have saved Baghdad from the jihadists.[3] Many militiamen abandoned established jobs and cozy lifestyles to sign on. Though largely drawn from Iraq's Shiite Muslim majority, which is concentrated in the south and center of the country, the 40 or so militias (or Popular Mobilization Units, as they are officially called) include Iraqis of other faiths and denominations. These groups—and their payroll—were formally amalgamated into the federal armed forces in 2016 but have retained considerable autonomy from the state, and are aligned, in the case of the most powerful, with neighbouring Iran. Others take their cues from Sistani and are much more overtly Iraqi nationalist in orientation.

But in interviews conducted across southern Iraq between 2014 and 2018, villagers, tribal leaders, and some of the men who joined these groups repeatedly stressed the extent to which deteriorating water and other environmental conditions had directly contributed to many farmers' and fishermen's decision to join militias. As residents of impoverished, often poorly connected communities, these rural Iraqi recruits had few prospects of securing jobs with the generally better salaried army and police forces, both of which can require social capital to join, but also no wherewithal to hold out for better offers. With little oversight of their finances, senior militiamen are reputed to skim their foot soldiers' wages. And by deliberately enticing the most desperate and disaffected youth with signing bonuses, leaders of some of the newer, less affluent groups were able to fill their ranks in ways that their lack of name recognition might otherwise have stifled.

According to one interviewee, recruiters went so far as to exploit isolated villages' geographical ignorance by suggesting that the extremists had penetrated much further south than they had. 'They told these fishermen that the war had reached Karbala', said Abu Hamad al-Asadi, a shopkeeper in Nasiriyah, referring to a holy city to the southwest of Baghdad. 'And they believed this. They thought the Islamic State would be in the village soon.'

Data on militia groups is limited, not least because of their contentiousness. Some of them have been accused of sectarian violence and deemed terrorists by the US.[4] However, senior figures from two of the biggest organizations, Saraya al-Salam and Badr, estimate that at least 55–60 per cent of their fighters hail from rural areas, more than double their share of the overall population, with disproportionate concentrations from the most battered marsh areas, in Badr's case. More than 400 residents of the tiny Abu Zarag marsh went to war against the Islamic State, according to Seyyid Mehdi Seyyid Hashem. At least 50 of them never returned. 'The reality is that these [farming] areas have an intense love for their homeland, so they fight', said Sheikh Abu Samir al-Mayahi, then Badr's head of operations in the Basra area in a 2015 interview. 'We can always rely on them to help us.'

Water crises

Southern Iraq's environmental woes have been a long time in the making and they are intimately wrapped up in the country's traumatic recent past. Starting with the Iran–Iraq war, which raged from 1980 to 1988, the region has been subjected to an almost unbroken series of landscape-altering disasters. First that war robbed the Basra area of many of its celebrated date palm plantations. Saddam Hussein torched many of the most bountiful ones to deprive Iranian forces of cover around the all-important oil fields. Others were destroyed in the fighting. All told, the number of palms is estimated to have fallen from more than 30 million to fewer than nine million since the 1950s.[5] 'They gave us a good life. But not anymore', said Yasar Ali, a farmer in Faw, a town at the end of a now-barren, but previously palm-covered peninsula to the south of Basra. 'Just look around you. Nothing can grow here now.' Palms thrived in the extreme heat and saline soils in a way that little else does.

Then, from the late 1980s, Hussein accelerated the draining of the great Mesopotamian marshes, which had inundated over 20 000 square kilometres between the Tigris and Euphrates since time immemorial. All half a million or so of their inhabitants—the 'Marsh Arabs'—were displaced, shattering a historic culture and irretrievably damaging the region's biggest wetland, in a move that was largely grounded in the dictator's bid to vanquish a longtime rebel hideout. The

[3] 'Iraq cleric issues call to arms against ISIL', Al Jazeera, 14 June 2014.
[4] 'US designates Iraqi Shiite militia as foreign terrorist organization', VOA, 4 Jan. 2020.
[5] Mahmoud, S., 'Inside the fight to save Iraq's date palm industry', *The National*, 10 May 2021.

marshes were reflooded after 2003 and up to half of the area's people returned, according to local NGOs, but marginal areas on the periphery, like the Abu Zarag marsh, have yet to regain anything like their previous lushness.[6]

In the 1990s and throughout the US-led invasion, a combination of sanctions that were imposed partly in response to Hussein's invasion of Kuwait, and a steady breakdown in governance and law and order fuelled a collapse of domestic wastewater and irrigation infrastructure that continues to this day. That damaged riparian fisheries, which were already reeling from saline agricultural runoff, and hurt buffalo farmers, whose animals continue to suffer from frequent skin diseases and lower yields in the dirty water. 'The buffalo are like people in this way', said Sayyid Mehdi Sayyid Hashem. 'They can't manage bad water either.' Desperate for money as their stocks decline and as fish farms proliferate, many fishermen have taken to stunning fish with electricity, a self-destructive practice which is hastening the shrinking of the fisheries.

All the while, the Iraqi state's fixation on energy revenues battered farmers in ways large and small. Roughly 90 per cent of the country's oil is extracted from under the fields, marshes and deserts of southern Iraq, and farmer welfare—and farmer employment—has seldom been a consideration in its exploitation.[7] Great puddles of sticky black crude glisten across farmland. Even more damaging, perhaps, has been successive governments' inattention to agriculture—and water planning in general—as its coffers have filled with oil wealth. In recent years, Iraq's farming policies have ranged from neglectful (with farmers waiting up to two years to be paid for crops delivered to state silos) to damagingly generous (in sometimes paying up to three times the international market price for crop staples and thereby incentivizing the cultivation of marginal land) to outright cruel (in arguably subjecting farmers to even more corruption than other Iraqis).

In addition to continuing pollution, inefficient water use, and deepening drought (interspersed with occasional extreme flooding) at home, events upstream in Turkey, and Iran have compounded the crisis.[8] Both countries have built dozens of large dams within the Tigris and Euphrates basins over the past few decades, and although the total reduction in the rivers' volume is disputed, all observers agree that significantly less water is passing into Iraq and through to the largely rain-deprived southern farming communities at the end of the supply. Once upon a time the Shatt al-Arab, the waterway formed by the confluence of the Tigris and Euphrates, propelled fresh water several miles out into the Persian Gulf, yet now the sea can barrel up to 80 km (50 miles) upstream during times of severe drought, according to a former water minister, which is magnifying the crop-killing impact of intensely saline water, particularly across Basra governorate.

This has all collectively fuelled an extreme shortage in usable water that the thirsty farmers and fishermen of southern Iraq have been particularly poorly placed to withstand. 'Our jobs are all connected to water', said a fisherman in the Hammar marsh who gave his name as Sajad. 'So what do you think happens when it looks like this?'

Rural poverty, migration and militias

The Marsh Arabs are a hardy lot, and some have managed to make the most of rural turmoil. Having decided that fishing was no longer viable, Mohammed Wael Abdellatif, a spiky haired 20-something year-old, used his experience in reviving troublesome boat engines to establish himself as a car mechanic. His neighbour in Chibayish, one of the largest towns within the marshes, bought a minibus with the last of his savings and converted it into a private ambulance. He now makes a good living transporting villagers to urban medical facilities. 'We've had to be smart to survive', Abdellatif says.

Many others are trucking along in reduced circumstances. Hussein Karaba's family once ate meat almost every day of the week, but with diminishing crop yields—and hence income—they have cut back to small portions on Fridays. In many villages, children have had to forgo everything from pocket money to textbooks to school itself. Students have been pulled from classes by fathers who need their labour in the fields, while some local businesses, like hair salons, have

[6] Biello, D., 'Reflooding restores wildlife to Iraqi marshes', *Scientific American*, 30 May 2006; and Schwartzstein, P., 'Iraq's famed marshes are disappearing—again', *National Geographic*, 9 July 2015.

[7] Mobillia, M. and Villar, L., 'Iraq's oil production has nearly doubled over the past decade', Today in Energy, US Energy Information Administration, 11 Jan. 2019.

[8] Mohammed, M. and Tawfeeq, M., 'Flash floods in northern Iraq kill 12 people', CNN, 17 Dec. 2021; and Hockenos, P., 'Turkey's dam-building spree continues, at steep ecological cost', Yale Environment 360, 3 Oct. 2019.

disappeared as disposable income crumbles. On a now dried-up bank of the Euphrates outside Chibayish, a group of unemployed young men routinely play football among the sunken boats and abandoned fishing nets. Poverty rates in southern Iraqi governorates remain higher than northern and western ones, even though the former were spared the direct consequences of the Islamic State's emergence.[9]

For thousands of rural southern Iraqis, this procession of never-ending disasters has simply proven intolerable. They have voted with their feet. Marsh residents who had returned from exile are moving again, likely for the last time. Residents of outlying areas are joining them in ever greater numbers. Across the south and beyond, cities are reeling from the volume of rural migrants, many of whom have arrived even as urban areas struggle to provide basic services and infrastructure for their longstanding populations. With no signs of any let up in farming woes, recent arrivals expect plenty more to follow them in from the countryside. 'Give it five more years, and my whole family will be here. I guarantee you', said Haidar al-Tamimi, a shop assistant in Basra city centre, who left his Dhi Qar governorate village ten years ago.

Yet, for many more, migration is unthinkable—or unviable—and it is among this cohort that the militias have enjoyed much of their success since 2014. In emerging at a time of greatest economic desperation, not least because the Islamic State's surge coincided with a fall in oil prices, they have been able to fill their ranks with ease—even while sometimes offering unattractive salaries. Though difficult to verify, rural Iraqi militiamen allege that they are paid as little as half of some of their urban or small-town peers. And by targeting the neediest communities, like the North Abu Zarag marsh, these groups were able to replenish their ranks at the height of the fight against the Islamic State, despite devastating casualty rates.

In some ways, this is 'normal.' From the US and other Western militaries, to jihadi groups, like Boko Haram and ISIS in Iraq, there's nothing unusual about concentrating recruitment among deprived areas.[10] In southern Iraq, this intensifying overlap between climate and wider environmental stresses and stability is also manifesting itself through increasing—and occasionally fatal—inter-tribal tensions over water, among other disputes.

But as an illustration of the extent to which water and environmental issues are contributing to increased rural poverty, and thereby boosting the attractiveness of employment with militia-like groups, the travails of Upper Zarag and similarly dessicated areas are potent. Significantly more exposed to climate and other environmental stresses than some of their urban peers, many rural Iraqis are more desperate and resentful than ever of the state that they feel has abandoned them to their water-impoverished fate. That increasingly yawning gap between the largely urban haves and agricultural have-nots has served the militias well, many of which initially presented themselves as a counterpoint to the unwieldy, ineffective government—and have consequently been well placed to subsume some of these 'left behind' rural men. 'We are smaller, more efficient, and more moral', Faleh al-Khazali, a politician and leader of the Kata'ib Sayyid al-Shuhada milita, said in a 2015 interview.

Mounting challenges

Iraqi authorities insist they are doing everything they can to address this rural rot, and there are some positive signs. After a few years of improved rains and stronger river flows through much of the Tigris and Euphrates basins, water buffalo numbers are climbing, rising from 285 000 to 385 000 since 2019.[11] A government scheme to restrict some food imports also appears to be yielding results—though similar previous measures have been short-lived, and this initiative could be undermined by water shortages.[12] For the past 20 years, Iraqi farmers have struggled to compete with cheaper Iranian and Turkish products. Amid oil price fluctuations, Baghdad is at least talking a bigger game about diversifying its largely rentier economy, with better and more

[9] UN International Children's Emergency Fund (UNICEF) and World Bank, *Assessment of Covid-19 Impact on Poverty and Vulnerability in Iraq* (UNICEF and World Bank: New York, June 2020).

[10] Tyson, A. S., 'Military recruiters target isolated, depressed areas', *Seattle Times*, 9 Nov. 2005; and Schwartzstein, P., 'Climate change and water woes drove ISIS recruiting in Iraq', *National Geographic*, 14 Nov. 2017.

[11] Fordham, A., 'In Iraq, herding water buffalo is once again a growing industry', NPR, 12 Apr. 2021.

[12] Foltyn, S., 'Iraq government bans imports to support local farmers', Al Jazeera, 9 Apr 2021; and 'Iraq to reduce winter crop area by 50% due to water shortage: Ministry statement', Reuters, 17 Oct. 2021.

expansive farming a key plank of that ambition—though politicians have frequently made these pledges before elections and then quietly dropped them in the aftermath.

Among local NGOs, too, there is more awareness of rural needs—and some additional help. From deploying drip irrigation technology, as opposed to wasteful flood irrigation, to persuading marsh fishermen to discard stunning devices, Iraqi civil society is stepping up in ways that neither the Iraqi nor foreign governments are. Having escaped recent conflict, rural southern Iraq has attracted many fewer foreign and domestic donor funds than governorates hammered by ISIS, which are themselves receiving significantly less than they require.

But with limited state capacity, particularly with those yoyoing oil prices, and failing governance, in part due to the additional dysfunction that these empowered militias have unleashed as they have emerged as a kind of state within the state (and as the most ardent upholders of the status quo, taken the lead in crushing the 2019 protest movement), few rural Iraqis harbour much hope of a change in fortunes. Many of these groups are so intent on preserving their recently won clout that they have even taken to killing off their critics.[13] Indeed, the challenges look set to mount in ways that may only deepen their misery. The year 2021 was yet another dreadful water year, with little rain and meagre snowpack in the mountains of Turkey, Iran, and Iraq limiting river flow, at the same time as temperatures spiked.[14] Southern Iraq, along with nearby parts of Iran and Kuwait, is now almost routinely posting record summer highs, and all without the regular electricity to subsist on air-conditioning.[15]

In the Upper Zarag marsh, residents are already seeing plenty of additional tension, as tribes and governorates go at one another in disputes that are at least partly grounded in water woes. And that makes them fearful. Because having seen firsthand how their environmental troubles left the community reliant on fighting and many of its men dead or maimed, they have little faith that much good can come of their lives unless water flow stabilises. 'We want peace', says Haidar Salim, the buffalo farmer who went to war. 'But right now, there's no water, and that's bad for anyone.'

[13] Loveluck, L. and Salim, M., 'In Iraq, powerful militias assassinate protesters with impunity', *Washington Post*, 12 May 2021.
[14] Norwegian Refugee Council, 'One in two families in drought-affected Iraq need food assistance', 16 Dec. 2021.
[15] Samenow, J., 'Iranian city soars to record 129 degrees: Near hottest on Earth in modern measurements', *Washington Post*, 4 Dec. 2021.