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CASCADIAN VIEWS

The Emperor Is Wearing No Clothes:

Beyond Hydrocarbons in the South China Sea

OCTOBER 2022

2022 John H. McArthur Research Fellow

Tabitha Grace Mallory

China Ocean Institute and University of Washington

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Introduction

We need only call to mind the first half of 2022 for an array of the extreme, energy-related global challenges we all face. Around the world, local versions of climate change effects—the temperatures, wildfires, droughts, storms, flooding—underscore how important it is for us to transition away from our overdependence on fossil fuels.[1] And our energy sources don't just have environmental implications but security ones as well. The Russian invasion of Ukraine is the latest rendition of the resource curse.[2] At the heart of it all, fossil fuels are what enabled and amplified the murderous narcissism we see in Vladimir Putin and created a country with an unbalanced and unhealthy domestic economy able to profoundly destabilize energy flows and prices around the world.[3]

The South China Sea (SCS) brings together its own assortment of these complex challenges and factors. Competing security concerns, resource needs, and nationalisms shape the motivations of the claimants. Much of the attention and conflict has centred on the oil and gas in the seabed.[4] Estimates of SCS hydrocarbon volumes vary; only some of these resources are proven reserves that have been confirmed and measured, and are actually recoverable.[5] But even in more generous assessments, the SCS only provides us with a small percentage of the global total of oil and gas reserves, and even less of the overall energy mix if we include non-fossil-fuel energy sources.

Beyond hydrocarbons, in a two-way tie with the adjacent Coral Triangle, the SCS has the highest level of marine biodiversity in the world. SCS fisheries feed and employ millions of people in the region. It's true that conflict over these living marine resources also drives the territorial disputes in the region, and a wide variety of human activity degrades the SCS ecosystem. Yet drilling for hydrocarbons in the SCS threatens this vulnerable marine habitat even more, while also clearly contributing to geopolitical and security tensions in the region—and to climate change.

[1] Gloria Dickie, "Climate Change Is Driving 2022 Extreme Heat and Flooding," *Reuters*, 28 June 2022, https://www.reuters.com/world/climate-change-is-driving-2022-extreme-heat-flooding-2022-06-28/.

[2] J.D. Colgan, *Petro-Aggression: When Oil Causes War*, Cambridge University Press, 2013, 328 pp., https://doi.org/10.1017/CBO9781139342476.

[3] Jeff Goodell, "Putin Is a Fossil Fuel Gangster. Clean Energy Could Cut Him Off at the Knees," *Rolling Stone*, 10 March 2022, https://www.rollingstone.com/politics/politics-features/putin-russia-ukraine-fossil-fuels-climate-change-1319417/.

[4] Robert Beckman, Ian Townsend-Gault, Clive Schofield, Tara Davenport, and Leonardo Bernard (eds.), *Beyond Territorial Disputes in the South China Sea: Legal Frameworks for the Joint Development of Hydrocarbon Resources*, Edward Elgar Publishing, 28 June 2013.

[5] Tim Daiss, "Why The South China Sea Has More Oil Than You Think," *Forbes*, 22 May 2016, https://www.forbes.com/sites/timdaiss/2016/05/22/why-the-south-china-sea-has-more-oil-than-you-think/?sh=475d833ddd8f; Caroline Wood and Ashley Uren, "Assessing the hydrocarbon exploration potential of the South China Sea," *First Break* 40, May 2022, pp. 77-81, DOI: 10.3997/1365-2397.fb2022041.

Given how destabilizing oil and gas pursuits have been for the SCS since the 1970s, we might ask ourselves whether we want to keep drilling for fossil fuels there. Do the costs and risks outweigh the benefits?[6]

The Challenge

To prevent the truly catastrophic impacts from climate change, we will need to limit the increase of the earth's average temperature to 1.5°C over pre-Industrial averages, but meeting that target is far from guaranteed.[7] Doing so requires reaching carbon neutrality by 2050.[8] Given how pervasive fossil fuels are throughout virtually all aspects of human society, extending beyond just energy needs to things like fertilizers and plastics, achieving the rate of decarbonization necessary to meet that goal would require technology shifts at a speed unprecedented in human history.[9] Meanwhile, natural gas is a widely accepted fossil-fuel-transition compromise, and the SCS has literally tons of it. Nonetheless, we would all benefit from discernment and purposefulness in deciding where offshore oil and gas operations take place.

Let's also not forget that carbon offsets and sequestration are as much a part of the net-zero equation as we want them to be. The SCS is quite valuable in this regard. If we think from a truly global scale and perspective—as the human species—the SCS has an unparalleled comparative advantage because of its marine biodiversity and living-resource abundance, not because of its oil and gas resources. If anything, we should drill for oil and gas elsewhere in the world instead, in places that are comparatively richer in fossil fuel resources over living resources, until perhaps someday we no longer even need to do that.

People have called the oil and gas in the SCS for what it is: a red herring, leveraged for various rival motives, even merely to preserve the status quo.[10] In any of the reasons, oil and gas also bring costs—as distraction from what is more important, and as ecological and environmental

[6] We've asked this question about other places: M.J. Kitchen and N.E. Burger, "Should we drill in the Arctic National Wildlife Refuge? An economic perspective," *Energy Policy* 35, 2007, pp. 4720–4729; Maria Lourdes D. Palomares and Daniel Pauly (eds.), *Too Precious to Drill: The Marine Biodiversity of Belize*, Fisheries Centre Research Reports, Volume 19 Number 6, University of British Columbia, 2011.

[7] IPCC [V. Masson-Delmotte, P. Zhai, H.O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)], Global Warming of 1.5°C: *An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty*, Cambridge University Press, Cambridge, UK and New York, NY, USA, 2018, 616 pp. https://doi.org/10.1017/9781009157940.

[8] António Guterres, "Carbon neutrality by 2050: the world's most urgent mission," United Nations, 11 December 2020, https://www.un.org/sg/en/content/sg/articles/2020-12-11/carbon-neutrality-2050-the-world%E2%80%99s-most-urgent-mission.

[9] Vaclav Smil, *How the World Really Works: The Science Behind How We Got Here and Where We're Going*, Viking, 2022.

[10] Ethen Kim Lieser, "How Much Oil and Gas Is Contained in the South China Sea?" *The National Interest*, 22 February 2021, https://nationalinterest.org/blog/buzz/how-much-oil-and-gas-contained-south-china-sea-178587.

destruction. Would stakeholders make better progress on fewer core contentions by taking oil and gas off the negotiating table? Doing so has the potential to bring the majority of us together in agreement and co-operation, but will require more nuanced thinking—or, to use a political science concept borrowed from psychology, more *integrative complexity*. Yet could we bring about a peace in the SCS that is not predicated on fossil fuel dependence?

Integrative Complexity

Let's start this cost-benefit thought experiment by using an integrative complexity approach to disaggregate some of the predominant arguments about the SCS.[11] Integrative complexity measures the degree to which a person's spoken or written communication reflects one-dimensional, black-and-white thinking (simplicity) versus multifaceted communication that considers multiple perspectives (complexity). Integrative complexity is an interesting variable for analysis because it has to do with not *what* people think but *how* people think. Analysis of levels of integrative complexity in state leaders has found that leaders who score low in integrative complexity tend to be less successful (we might invoke the cautionary tale of Putin again here). Studies of integrative complexity and international confrontation show that integrative complexity in government documents and leader speeches tends to drop in the two to six months prior to a war—independent of content (statements can be peaceful or bellicose). Integrative complexity increases in the time preceding a co-operative resolution to a conflict. And integrative complexity tends to be reciprocal—if one side exhibits high levels, the other side tends to mirror them. Measures of integrative complexity in the elites and mass media tend to follow the same patterns as the government in times of conflict, meaning that thinking becomes flatter and more binary among everyone in the population.

For the SCS, two key but separate issues have been conflated. The first issue is the debate over maritime jurisdiction and the rights that coastal states have to resources in their own exclusive economic zones (EEZs) according to international law. Nearly all the SCS claimant states have efforts underway to survey and develop oil and gas in the SCS, though most protest the unilateral efforts of others to do so.[12] For the Philippines, Vietnam, Malaysia, and Indonesia in particular, their offshore operations serve (partly) as an exercise and demonstration of this right. The rationale is similar to that of the United States and other countries engaging in freedom of navigation operations (FONOPs) in the SCS and elsewhere in the world.[13] But the second issue concerns whether offshore hydrocarbon extraction in the SCS is a good idea in the

[11] For a comprehensive literature review of this topic, see Seudfeld, Peter, "The Cognitive Processing of Politics and Politicians: Archival Studies of Conceptual and Integrative Complexity," *Journal of Personality* 78:6, December 2010, pp. 1669–1702, DOI: 10.1111/j.1467-6494.2010.00666.x.

[12] Center for Strategic and International Studies, Asia Maritime Transparency Initiative, *South China Sea Energy Exploration and Development*, https://amti.csis.org/south-china-sea-energy-exploration-and-development/.

[13] U.S. Department of Defense, *Freedom of Navigation (FON) Program Fact Sheet*, 28 February 2017, https://policy.defense.gov/OUSDP-Offices/FON/. For more on U.S. interests in the SCS, see Gregory B. Poling, *On Dangerous Ground: America's Century in the South China Sea*, Oxford University Press, 2022, 336pp.

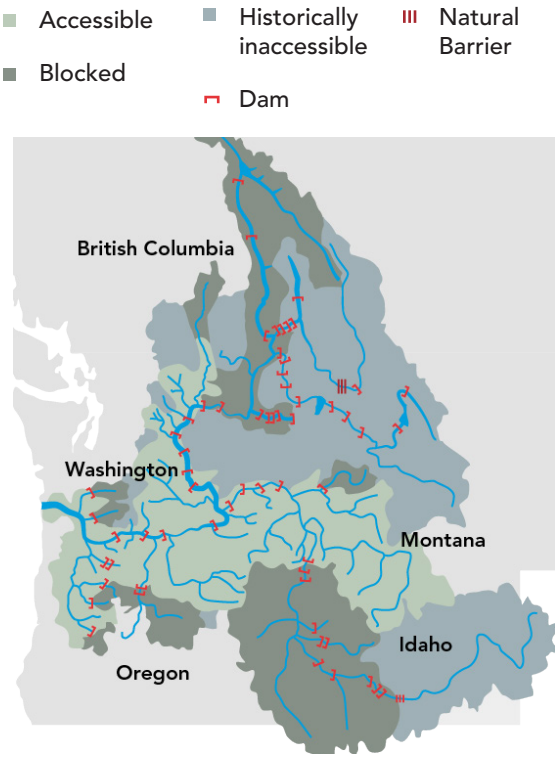
first place, given the negative impact on the marine environment that such activities have, plus the climate change reasons. Lumping these issues together contributes to simplistic us-versus-them rhetoric over the SCS, and nationalism amplifies this tone in the general public, in all of the stakeholding states.[14]

To be sure, it is not just maritime claims at stake. Claimant states also have real needs for energy independence and inputs for economic development. Figuring out alternative energy sources and new energy mixes will not be easy, though this is the case everywhere in the world.

Take, for example, the challenge in Cascadia. For over half a century, the hydroelectric dams in the Canadian and U.S. Pacific Northwest have provided electricity that is cheap and—almost worse, in a sort of excruciating irony—*already free of carbon emissions*. However, these dams harm salmon populations, meaning less biodiversity and less locally sourced food for humans, marine mammals, and other organisms in the ecosystem.[15] The issue is complex—crossing borders (see Figure 1), involving Indigenous treaty rights, affecting transportation systems in unexpected ways, and even transcending the usual partisan nature of U.S. politics.[16] In 2011–14, the costly and protracted removal of just two of the dams in the area was the largest project of its kind

FIGURE 1

Map of current and historical distribution of salmon and steelhead in the Columbia Basin, including currently blocked areas



Source: National Marine Fisheries Service 2020. A vision for salmon and steelhead: goals to restore thriving salmon and steelhead to the Columbia River basin. Phase 2 report of the Columbia River Partnership Task Force of the Marine Fisheries Advisory Committee. Portland, OR. https://s3.amazonaws.com/media.fisheries.noaa.gov/2020-10/MAFAC_CRB_Phase2ReportFinal_508.pdf.

[14] Oriana Skylar Mastro, "What are China's leaders saying about the South China Sea?" The Lowy Institute, 24 February 2021, https://www.lowyinstitute.org/the-interpreter/what-are-china-s-leaders-saying-about-south-china-sea; Wendy He Qingli and Haridas Ramasamy, "Naming and Shaming China: America's Strategy of Rhetorical Coercion in the South China Sea," *Contemporary Southeast Asia* Vol. 43, Issue 3, Dec. 2020.

[15] Skylar Sumner, "Frankly My Dear, I Don't Want a Dam: Refocusing Dam Removal Priorities to Protect Endangered Salmon Now," 25 *Animal Law* 75-92 (2018).

[16] Michael C. Blumm, *Pacific Salmon Law and the Environment: Treaties, Endangered Species, Dam Removal, Climate Change, and Beyond*, Environmental Law Institute, 2022, 303pp.; Mark Walker and Chris Cameron, "Plaintiffs in Long Fight Over Endangered Salmon Hope a Resolution Is Near," *New York Times*, 15 August 2022, https://www.nytimes.com/2022/08/15/us/politics/salmon-dams-washington.html.

in the world.[17] But as the authors of an engineering study that assessed potential alternative energy sources for the region concluded: "Energy production decisions are strongly associated with climate change, and climate change will influence energy production decisions. In this case, the decision to find alternatives to hydro energy production through dams was motivated by another important environmental issue, that of species decimation and biodiversity."[18]

SCS Marine Biodiversity

The SCS is certainly valuable because of its strategic location and potential hydrocarbon resources, but the SCS is arguably most valuable because of its marine biodiversity. This biodiversity includes not only species variation and genetic diversity within particular species, but also habitat diversity and functional diversity within habitats.

Protecting marine biodiversity is important for a number of reasons. Some of the motivations are obvious, for example, because the ocean is a key food source for billions of people, and valued for esthetic reasons.[19] But in the past few decades, scientists have discovered the extent to which preserving marine biodiversity is imperative for less obvious reasons, such as tempering the effects of coastal storms and tsunamis, and stabilizing the earth's climate through the uptake of carbon dioxide by phytoplankton.[20] Marine biodiversity is also important for environmental resilience—the ability of a natural system to recover from damage.

One of the most compelling arguments for the conservation of marine biodiversity is its potential for pharmaceutical uses and scientific research.[21] The ocean contains animal phyla that do not exist on land, and marine biochemistry is also more diverse. Sessile species—marine animal species like corals that do not move—are valuable for medicinal purposes because of the unique chemical defences they have evolved against predators. These chemicals have potential anti-viral and anti-cancer benefits for human use. And because of their high levels of biodiversity, the marine tropics have the most potential in the world for scientific advancement in this field (see Figure 2). Aside from medicinal purposes, studying marine life can also advance our understanding of topics such as cellular communication and bone growth.

[17] Michelle Nijhuis, "World's Largest Dam Removal Unleashes U.S. River After Century of Electric Production," *National Geographic*, 26 August 2014, https://www.nationalgeographic.com/science/article/140826-elwha-river-dam-removal-salmon-science-olympic.

[18] D.H.B. Gai and E. Shittu, "Salmon Versus Power: Dam Removal and Power Supply Adequacy," in *IEEE Engineering Management Review*, vol. 49, no. 2, pp. 126-133, June 2021, doi: 10.1109/EMR.2021.3069349.

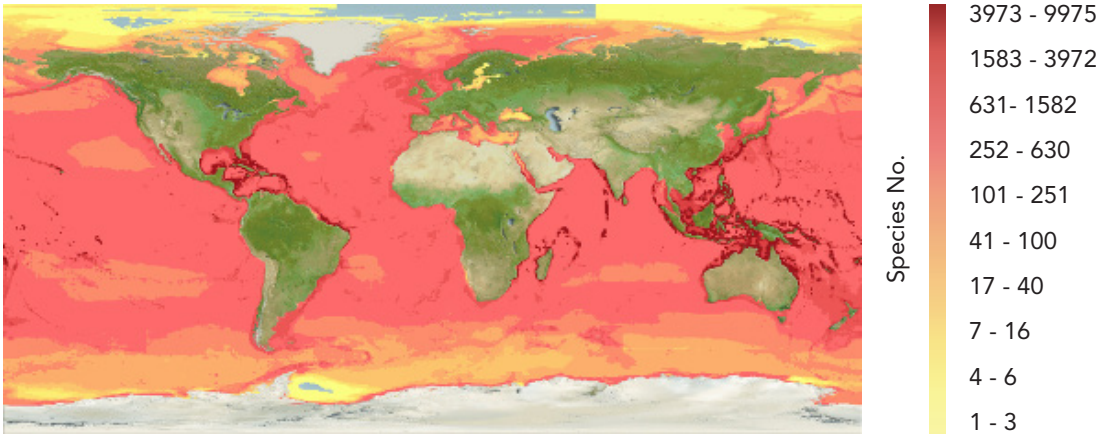
[19] High Level Panel for a Sustainable Ocean Economy, https://oceanpanel.org/.

[20] Elliott A. Norse, *Global Marine Biological Diversity: A Strategy for Building Conservation into Decisionmaking*, Washington, D.C.: Island Press, 1993.

[21] David Leary, et al., "Marine genetic resources: A review of scientific and commercial interest," *Marine Policy*, Vol. 33, 2009, pp. 183–194.

FIGURE 2

Species richness averaged across species distribution models, 1991–2010



Source: K. Kaschner, K. Kesner-Reyes, C. Garilao, J. Segschneider, Rius-Barile, T.J. Rees, & R. Froese (2019, October). AquaMaps: Predicted range maps for aquatic species. Retrieved from https://www.aquamaps.org.

The SCS has the highest level of marine biodiversity in the world, along with the Coral Triangle between Indonesia, the Philippines, Papua New Guinea and the Solomon Islands, even though the SCS is only one-sixth of the size of the Coral Triangle.[22] A study published in 2000 identified more than 8,600 different species of marine plants and animals, and that number is likely an underestimate because several phyla have not been closely examined.[23]

The SCS is extraordinarily abundant in terms of its fish species, though fishing pressure has changed both the original availability and species mix. The SCS has pelagic species like tuna, billfish, and mackerel; demersal fishes such as snappers and soles; reef fishes like groupers and parrotfish; small coastal pelagic fishes like herring, sardine, and anchovy; and, invertebrates like crab, shrimp, and squid (see Figure 3).[24] Seven of the nine global giant clam species are found in the SCS.[25] Fishing has the largest impact on the SCS ecosystem, especially demersal

[22] Brian Morton and Graham Blackmore, "South China Sea," *Marine Pollution Bulletin*, Vol. 42, No. 12, 2001, pp. 1236–1263.

[23] Peter K.L. Ng, and K.S. Tan, "The State of Marine Biodiversity in the South China Sea," *The Raffles Bulletin of Zoology Supplement*, Vol. 8. 2000, pp. 3–7. Some small updates were added in S. H. Tan and I-Shiung Chen, "Aquatic Biodiversity Of The South China Sea," *Raffles Bulletin of Zoology*, Supplement Series No. 19 (2008): i–iii, 1–292. See also Maria Lourdes D. Palomares and Daniel Pauly (eds.), *Marine Biodiversity in Southeast Asian and Adjacent Seas: Part 1*, Fisheries Centre Research Reports, Vol. 18, no. 3, University of British Columbia, 2010, https://open.library.ubc.ca/soa/cIRcle/collections/facultyresearchandpublications/52383/items/1.0074736.

[24] Allison Witter, et al., *Taking Stock and Projecting the Future of South China Sea Fisheries*, Vancouver: University of British Columbia, 2015.

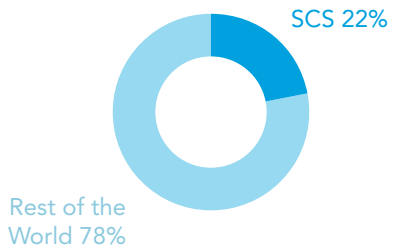
[25] T. Tomascik, A. J. Mah, A. Nontji and M. K. Moosa, *The Ecology of the Indonesia Seas*, Singapore: Periplus Editions (HK) Ltd., 1997.

trawl fisheries, outweighing pollution and environmental change.[26] A better fisheries management system would also help protect the marine environment in the SCS, but more stakeholder time and resources are devoted to the oil and gas discussions.[27]

The SCS also has 50 of the world's 70 coral genera, and a number of rare coral species (see Figure 4).[28] Coral reefs are important because they function as breeding grounds and food sources for marine life and need to be conserved both for species rarity and richness. Often areas that are not high in number of species will have rare coral species, and vice versa.

FIGURE 3

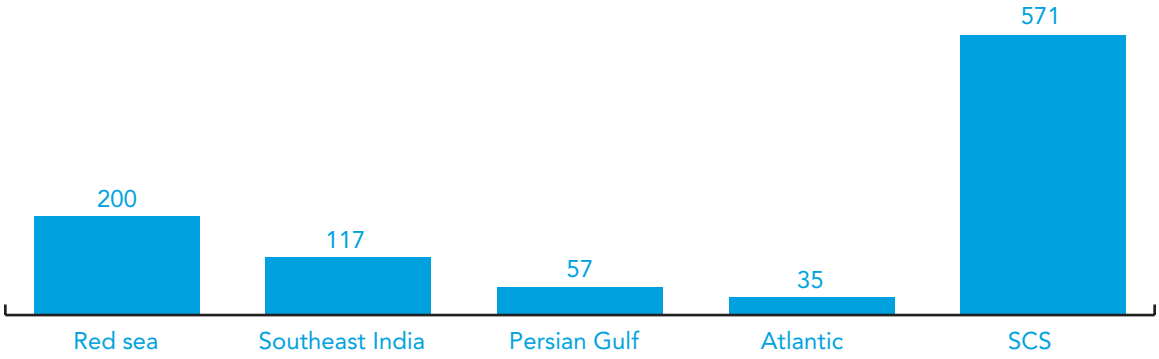
SCS Share of Global Fish Species



Source: J.E. Randall, K.K.P. Lim, "A checklist of the fishes of the South China Sea," *The Raffles Bulletin of Zoology* Supplement, Vol. 8, 2000, pp. 569-667. Researchers have classified 3,790 different types of marine fish species, across 263 families, out of a global total of 17,200 species.

FIGURE 4

Coral Species in Various Geographies



Source: C. Wilkinson, et al., South China Sea, GIWA Regional assessment 54, UNEP, University of Kalmar, Kalmar, Sweden, 2005, pp. 18–19; Danwei Huang, et al., "Extraordinary Diversity of Coral Reefs in the South China Sea," Marine Biodiversity, Vol. 45, 2015, pp. 157–168.

[26] V.T. Christensen, L.R. Garces, G.T. Silvestre, D. Pauly, "Fisheries impact on the South China Sea large marine ecosystem: a preliminary analysis using spatially explicit methodology," in: Silvestre, L. Garces, I. Stobutzki, M. Ahmed, R.A. Valmonte-Santos, C. Luna, L. Lachica-Alino, P. Munro, V. Christensen, D. Pauly (Eds.), *Assessment, Management and Future Directions for Coastal Fisheries in Asian Countries*. WorldFish Center Conference Proceedings 67, WorldFish Center, Penang, Malaysia, 2003, pp. 51–62, http://pubs.iclarm.net/resource_centre/proceedings.pdf.

[27] Hongzhou Zhang, Mingjiang Li (eds.), "Special Issue: Fisheries governance in the South China Sea: Problems, Progress, and Prospects," *Marine Policy* 121, November 2020; Centre for Humanitarian Dialogue, "South China Sea Fish Stocks at Risk without Regional Cooperation, Five-Country Scientific Report Warns," 2 September 2022, https://www.hdcentre.org/updates/south-china-sea-fish-stocks-at-risk-without-regional-cooperation-five-country-scientific-report-warns/.

[28] Huang, Danwei, et al., "Conservation of reef corals in the South China Sea based on species and evolutionary diversity," *Biodiversity Conservation*, Vol. 25, 2016, pp. 331–344; Tomascik et al., 1997.

The areas in the SCS with the largest number of rare coral are off the coast of West Malaysia and northern Palawan. Western Luzon and Brunei are also home to rare species. The area with the most species richness is Southern Vietnam.[29] Southeastern China does not have species richness but does have some rare coral species.

Climate change also poses a threat to the SCS through ocean acidification, changing ocean currents and temperatures, and sea-level rise.[30] However, a study of the destruction of coral reefs along China's coast and in the South China Sea showed that climate change was having much less of an impact on the reefs than coastal development, pollution, overfishing, and destructive fishing practices.[31] Nearly 80 per cent of China's coral cover on fringing reefs along the Chinese coast has been destroyed by anthropogenic causes since the 1980s, and coral cover in the major SCS features declined from more than 60 per cent to 20 per cent coverage in just the first decade of the 2000s.[32] Installment of facilities on the features in the SCS with the purpose of bolstering and defending maritime claims has also harmed coral habitat.[33]

The coastlines along the SCS basin are also edged with other important habitat types like wetland areas, with their marine flora such as mangroves, seagrass, and salt marshes that are especially important for carbon sequestration, or blue carbon (carbon stored in coastal and marine ecosystems).[34] Mangroves store more carbon per unit area than any other ecosystem on our planet besides tundra and peatlands, removing 10 times more carbon from the atmosphere than tropical forests.[35] The SCS has 45 of the global 51 mangrove species—the Atlantic, in contrast, has only five of them.[36] While seagrass only accounts for 0.1 per cent of the seabed, it sequesters 11 per cent of the ocean's carbon.[37] The SCS is home to 20 of the 50 global seagrass species.[38]

[29] *Ibid*.

[30] Scott C. Doney, et al., "Climate Change Impacts on Marine Ecosystems," *Annual Review of Marine Science*, Vol. 4, January 2012, pp. 11–37.

[31] Terry P. Huges, Hui Huang, and Matthew A.L. Young, "The Wicked Problem of China's Disappearing Coral Reefs," *Conservation Biology*, Vol. 27, No. 2, 2012, pp. 261–269.

[32] *Ibid*.

[33] David Cyranoski, "Ecosystem Fear in South China Sea," *Nature*, Vol. 535, 21 July 2016, pp. 334–335.

[34] C.M. Duarte, J. Middelburg, N. Caraco, "Major role of marine vegetation on the oceanic carbon cycle." *Biogeosciences* 2, 1–8. (10.5194/bg-2-1-2005).

[35] D.M. Alongi, "Global Significance of Mangrove Blue Carbon in Climate Change Mitigation." Sci. 2020; 2(3):67. https://doi.org/10.3390/sci2030067; E. Mcleod, G.L. Chmura, S. Bouillon, R. Salm, M.Björk, C.M. Duarte, C.E. Lovelock, W.H. Schlesinger, and B.R. Silliman (2011), "A blueprint for blue carbon: toward an improved understanding of the role of vegetated coastal habitats in sequestering CO2." *Frontiers in Ecology and the Environment*, 9: 552-560. https://doi.org/10.1890/110004.

[36] M. D. Spalding, F. Blasco, and C.D. Field (Eds.). *World Mangrove Atlas*. The International Society for Mangrove Ecosystems, Okinawa, Japan, 1997. 178pp.

[37] National Oceanic and Atmospheric Administration (NOAA), Coastal Blue Carbon, https://oceanservice.noaa.gov/ecosystems/coastal-blue-carbon/.

[38] S. Sudara, M. Fortes, Y. Nateekanjanalarp, and S. Poovachiranon. "Human uses and destruction of ASEAN seagrass beds," in: Wilkinson, C.R. (ed.), *Living Coastal Resources of Southeast Asia: Status and Management*. Report of the Consultative Forum Third ASEAN-Australia Symposium on Living Coastal Resources, May 1994, Thailand. Australian Agency for International Development, 133pp.

Experts believe that biodiversity is largely in decline in the SCS. A 2012 environmental assessment of the SCS found—along 69 measures of biodiversity—that 80 per cent of the SCS marine biodiversity was graded as in poor condition, with 10 per cent in good condition and 10 per cent in very poor condition.[39] And the proliferation of oil and gas drilling platforms has the potential to cause further damage.

Effects of Offshore Oil and Gas Drilling

In 1962, the California Department of Fish and Game issued a report detailing the results of a three-year project to study the impact of offshore oil drilling on the marine environment in Santa Monica Bay. Four of the five offshore drilling installations were located near Santa Barbara. The authors concluded, rosily, that:

> During the study there was no evidence of deleterious effects from any part of the operation.... The entire operation was very clean and the island towers served to enhance the habitat. Many fishes have been attracted to the installations and a heavy encrustation of various organisms has developed on the structures. This encrustation includes such animals as kelp scallops, barnacles, and mussels and has added greatly to the available fish food.[40]

The Santa Barbara oil spill that occurred seven years later was the largest in history at its time, and the widespread public horror in reaction to waves of dead birds and marine animals washing onto beaches spurred the creation of the U.S. environmental policy and regulatory system (and also the first Earth Day).[41] Despite increased oversight over offshore drilling, in 2010, the Deepwater Horizon disaster became the largest oil spill in global history, killing 11 workers and thousands of animals, including hundreds of dolphins, whose population will still require decades to recover.[42]

High-profile blowouts like Santa Barbara and the Deepwater Horizon are somewhat rare—they happen on average every 17 years globally—but offshore oil and gas extraction poses threats to the marine environment from routine operations too.[43] These effects include artificial light

[39] Trevor J. Ward, *Regional Scientific and Technical Capacity Building Workshop on the World Ocean Assessment: Workshop Report on South China Sea*, Bangkok: UNEP/COBSEA, October 2012. On a scale ranging from *very poor* to *poor* to *good* to *very good*.

[40] Charles H. Turner, John G. Carlisle, and Earl E. Ebert, "Offshore Oil Drilling, Its Effect upon the Marine Environment," California Department of Fish and Game, Marine Resources Operations, Terminal Island, CA, February 1962, 56pp.

[41] T.S. Spezio, "The Santa Barbara Oil Spill and Its Effect on United States Environmental Policy," *Sustainability* 2018, 10, 2750; doi:10.3390/su10082750.

[42] "BP oil spill is sending record number of dolphins to watery graves, scientists say." Washingtonpost.com, 20 May 2015; "University of St Andrews - Dolphin population will take 40 years to recover from Deepwater Horizon disaster." ENP Newswire, 14 Feb. 2017.

[43] E.E. Cordes, D.O.B. Jones, T.A. Schlacher, et al., "Environmental Impacts of the Deep-Water Oil and Gas Industry: A Review to Guide Management Strategies," *Frontiers in Environmental Science* 4(58) (2016) 1–26.

disruptions and soundwaves from seismic survey activities. The installation of equipment and dragging of anchors damages the seabed, including through increased sedimentation, as do corrosion and leaking from pipelines. Operations also create waste and contamination (such as drill cuttings, cement, dissolved minerals, trace metals, radioactive material, and production chemicals). These ecological disturbances are typically found within 200–300 metres of a wellhead, but the impact on some species can extend to 1–2 kilometres. Many of these deep-sea demersal and benthic species have slow recovery times.

Accidents smaller than the Deepwater Horizon also occur, with more frequency, and the risk of accidents increases with greater drill depth.[44] Between 1974 and 2008, there were 166 spills greater than 1,000 barrels globally, or approximately one every 2.5 months. Between 1971 and 2010, the United States had 23 large spills, approximately every 21 months, plus one-to-three small spills weekly.

Industrial Capture in the SCS

The energy needs of Vietnam, the Philippines, Malaysia, and Indonesia (along with other Southeast Asian countries) are rising, particularly driven by electricity demand. Hopes were hung on natural gas to wean countries off coal use. But instead, coal's proportion of SE Asia's energy mix grew from 20 to 40 per cent over the first two decades of the 2000s, making it one of the few regions in the world where coal consumption is increasing.[45] Natural gas is the second largest energy source for electricity, but its share is expanding at a slower rate than coal, and more slowly than predicted.[46]

Natural gas is the more feasible SCS resource for SE Asian states, over oil. But the estimated projected boost from producing oil and gas in SCS disputed areas is nonetheless only a small portion of the existing global oil and gas reserves, and far less than projected demand in the region, meaning these disputed resources would not come close to assuring Asian energy security (see Figure 5).[47] Thus, SE Asian countries are really still at a crossroads when thinking about their energy supplies.

[44] *Ibid*.

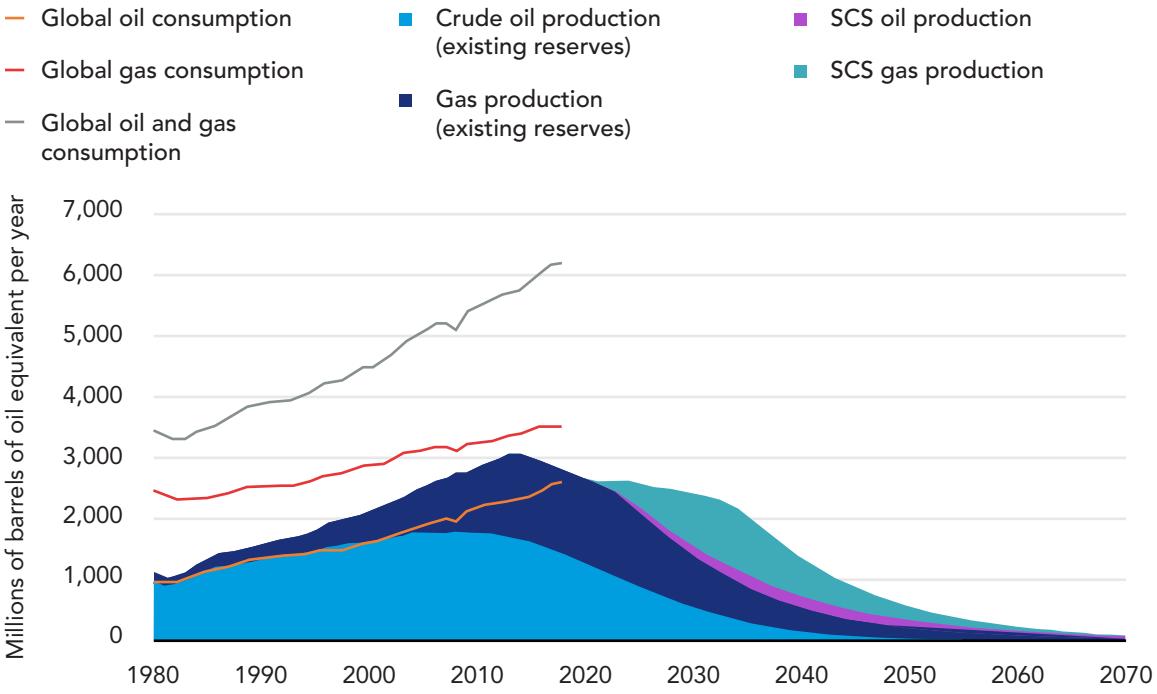
[45] X. Chen and D.L. Mauzerall, "The expanding coal power fleet in Southeast Asia: Implications for future CO2 emissions and electricity generation." *Earth's Future*, 2021, 9, e2021EF002257. https://doi.org/10.1029/2021EF002257.

[46] Sylvie Cornot-Gandolphe, *The role of coal in Southeast Asia's power sector and implications for global and regional coal trade*, Oxford Institute for Energy Studies, 2016, https://www.oxfordenergy.org/wpcms/wp-content/uploads/2016/12/The-role-of-coal-in-Southeast-Asias-power-sector-CL-4.pdf.

[47] N. Owen, C. Schofield, "Disputed South China Sea hydrocarbons in perspective," *Marine Policy* (36) (2012) 809–822.

FIGURE 5

SCS Oil and Gas Compared to Global Oil and Gas



Source: Based on N. Owen, C. Schofield, "Disputed South China Sea hydrocarbons in perspective," Marine Policy (36) (2012) 809–822; updates by author from U.S. Energy Information Administration, International Data, https://www.eia.gov/international/data/world.

If such little material benefit is to be gained from hydrocarbon production in the SCS—either in terms of meeting energy security or indirectly boosting local economies—then we need to factor in the costs of hydrocarbon extraction in terms of potential damage to the region's marine biodiversity, added carbon emissions, and increased geopolitical tensions. Because in the business-as-usual scenario, only the fossil fuel companies truly reap the benefits of hydrocarbon extraction, and only in short-term gains. The longer-term opportunity cost to the rest of us is enormous.

A 2019 statement by the U.S. Embassy in Vietnam illustrates the stranglehold that the oil and gas industry has on this issue, regardless of the enterprise country of origin. It's also an example of a statement that lacks integrative complexity, showing how thoroughly oil and gas has been interwoven into the maritime jurisdictional issue (emphasis added):

> In recent weeks, China has taken a series of aggressive steps to interfere with ASEAN claimants' longstanding, well-established economic activities, ***in an attempt both to coerce them to reject partnerships with foreign oil and gas firms, and to work only with China's state-owned enterprises.*** In the case of Vanguard Bank, China is pressuring Vietnam over its work with **a *Russian energy firm and other international partners.***

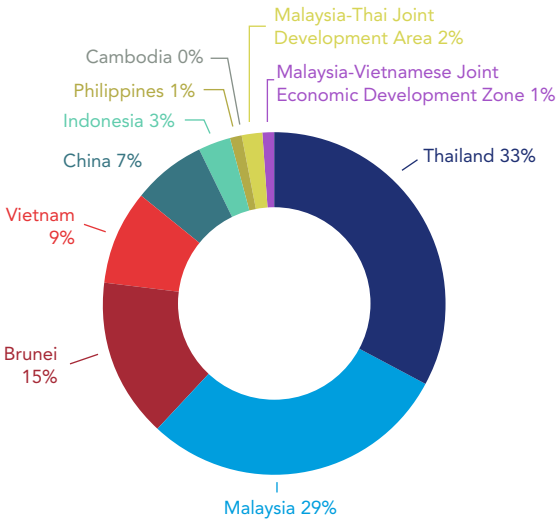
China's actions undermine regional peace and security, impose economic costs on Southeast Asian states by ***blocking their access to an estimated $2.5 trillion in unexploited hydrocarbon resources***, and demonstrate China's disregard for ***the rights of countries to undertake economic activities in their EEZs,*** under the 1982 Law of the Sea Convention, which China ratified in 1996.

U.S. companies are world leaders in the exploration and extraction of hydrocarbon resources, including offshore and in the South China Sea. The United States therefore strongly opposes any efforts by China to threaten or coerce partner countries into withholding cooperation with non-Chinese firms, or otherwise harassing their cooperative activities. The United States is committed to bolstering the energy security of our partners and allies in the Indo-Pacific region and in ***ensuring uninterrupted regional oil and gas production for the global market.***[48]

There is a unique kind of inconvenient truth here. The smaller claimant states are the ones pursuing oil and gas production the most zealously in the SCS. Four Southeast Asian states have more offshore platforms in the SCS than China does (see Figure 6). And not only are offshore platforms are growing in number, they are also increasing in depth and distance from shore, which is increasing the risk of accidents and damage (see Figure 7).

FIGURE 6

Share of Offshore Hydrocarbon Platforms in the SCS by Country

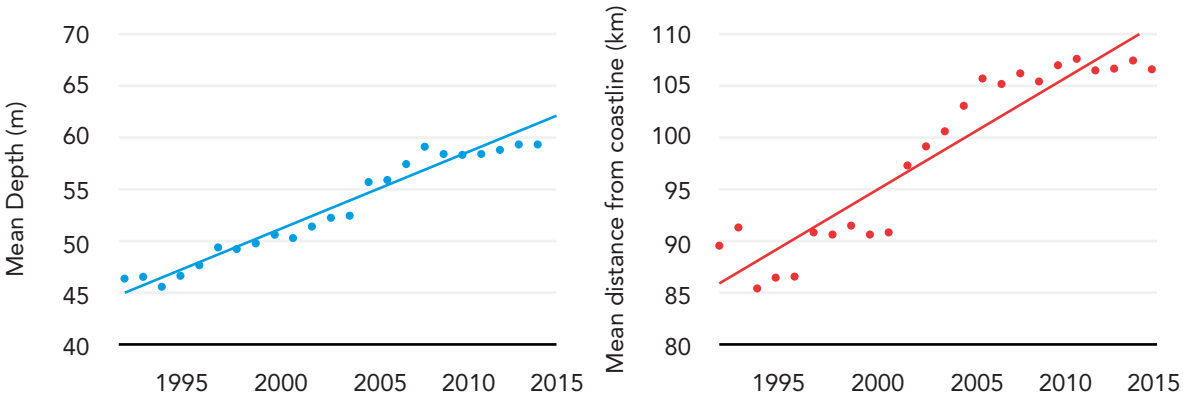


Source: Thailand (356), Malaysia (317), Brunei (166), Vietnam (91), China (76), Indonesia (29), Philippines (8), Cambodia (1), Malaysian–Thai Joint Development Area (MTJDA) (25), Malaysian–Vietnamese Joint Economic Development Zone (MVJEDZ) (13). Y. Liu, C. Sun, J. Sun, H. Li, W. Zhan, Y. Yang, S. Zhang, "Satellite data lift the veil on offshore platforms in the South China Sea," *Scientific Reports* 6(33623) (2016) 1–9.

[48] U.S. Embassy and Consulate, China Escalates Coercion against Vietnam's Longstanding Oil and Gas Activity in the South China Sea, 23 August 2019, https://vn.usembassy.gov/china-escalates-coercion-against-vietnams-longstanding-oil-and-gas-activity-in-the-south-china-sea/.

FIGURE 7

SCS Platforms Depth and Distance from Coastline



Source: Y. Liu, C. Sun, J. Sun, H. Li, W. Zhan, Y. Yang, S. Zhang, "Satellite data lift the veil on offshore platforms in the South China Sea," *Scientific Reports* 6(33623) (2016) 1–9.

What Are the Alternatives?

States have rights under the UN Convention on the Law of the Sea (UNCLOS) to pursue oil and gas production in their own EEZs, and to be free from the interference of outside forces for doing so. However, rights to resources are not the only basis on which jurisdictional claims can be demonstrated. Article 56 of UNCLOS also assigns states the duty to conserve and manage natural resources, and to protect and preserve the marine environment.[49] States could exercise maritime jurisdiction by excluding environmentally harmful actors and activities from their waters instead. This path would not be completely free of its own confrontational risks, but we do know for sure that pursuing development of hydrocarbon resources results in confrontation.[50]

Here we can draw on a lesson from fisheries law enforcement. In 1994, the U.S. and China established a bilateral shiprider agreement for their coast guard forces to jointly patrol the Pacific high seas for the illegal driftnet fishing of anadromous fish stocks (such as salmon).[51] At first glance, the expiration of this agreement may appear to be merely another casualty of the downturn in U.S.–China relations in the 2010s, but a lapse in this arrangement is,

[49] UN Convention on the Law of the Sea, https://www.un.org/Depts/los/convention_agreements/texts/unclos/unclos_e.pdf.

[50] Helen Clark, "Oil and gas fueling South China Sea tensions," *Asia Times*, 22 July 2020, https://asiatimes.com/2020/07/oil-and-gas-fueling-south-china-sea-tensions/.

[51] "Memorandum of Understanding Between the Government of the United States of America and the Government of the People's Republic of China on Effective Cooperation and Implementation of United Nations General Assembly Resolution 46/215 of December 20, 1991," signed 3 December 1993, in NOAA, *International Agreements Concerning Living Marine Resources of Interest to NOAA Fisheries*, U.S. Department of Commerce, 2010.

in some ways, also a sign of its success.[52] The partnership has been successful because the fishing quota is zero—everyone agreed that any amount of this type of fishing is harmful. It's not only enforcement, but management and regulation are also harder when some of the activity in question is allowed. One only needs to start asking who gets to drill what, where, when, how much, and why to understand how this is the case. Enforcing an oil and gas drilling moratorium would even have a benefit over a fishing moratorium—"illegal, unreported and unregulated offshore hydrocarbon drilling" is hardly likely, given that most actors do not possess the kinds of capital and technology needed to be successful (and stay alive).

But if not by drilling for oil and gas in the SCS, how then should states meet their energy needs? There is an answer, but it's another tough sell all on its own, even before we add the SCS complexities. We will need to invest more in nuclear energy. If the majority of us believes that what most of the science says about climate change is true, then it makes sense to similarly take into account what the science tells us about nuclear energy. Nuclear energy has virtually zero carbon emissions, operates with far more steadiness and consistency than other non-fossil-fuel sources, and has resulted in only a small fraction of the deaths and disease that fossil fuels have caused.[53]

If the United States seeks both to increase economic co-operation with countries in the Indo-Pacific, and to be technologically competitive with China, nuclear energy co-operation is a more promising avenue than photovoltaic cells and electric vehicles (though we need those as well).[54] If the United States genuinely cares about "bolstering the energy security of partners and allies in the Indo-Pacific" and mitigating human security threats like pollution and natural disasters, then it should work with SE Asian countries to build nuclear electricity plants and grids to help supply their energy needs instead of encouraging them further into fossil-fuel path dependency.[55] The U.S. has an advantage in being the world's leading producer of nuclear energy already, generating twice as much energy from nuclear as the second largest producer, China.[56] (And incidentally, it's the Pacific Northwest that is leading new developments in

[52] Raissa Robles, "US Coast Guard renegotiating deal with China for joint enforcement, even as it bulks up presence in western Pacific," *South China Morning Post*, 3 August 2021, https://www.scmp.com/week-asia/politics/article/3143561/us-coast-guard-renegotiating-deal-china-joint-enforcement-even.

[53] Scott L. Montgomery and Thomas Graham Jr., *Seeing the Light: The Case for Nuclear Power in the 21st Century*, Cambridge University Press, 2017.

[54] U.S. White House, Statement on Indo-Pacific Economic Framework for Prosperity, 23 May 2022, https://www.whitehouse.gov/briefing-room/statements-releases/2022/05/23/statement-on-indo-pacific-economic-framework-for-prosperity/; Akin Gump, Foreign Policy Side-by-Side: Division D of the America COMPETES Act versus Division C of the U.S. Innovation and Competition Act. 14 February 2022, https://www.akingump.com/a/web/npXZYbf7Pzhm1zHfWEdHuM/akin-gump-competes-act-and-usica-division-d-side-by-side2.pdf.

[55] V. Nian and J. Bauly, "Nuclear Power Developments: Could Small Modular Reactor Power Plants be a 'Game Changer'– The ASEAN Perspective." *Energy Procedia* 2014, 61, 17–20.

[56] Nuclear Energy Institute, Top 15 nuclear generating countries, August 2022, https://www.nei.org/resources/statistics/top-15-nuclear-generating-countries.

U.S. nuclear technology.[57]) Except for China, none of the other SCS claimant states have nuclear power plants.[58] But Vietnam, the Philippines, Malaysia, and Indonesia have expressed interest in nuclear energy.[59] Canada, Japan, South Korea, France, and Germany—also among the world's top 10 producers of nuclear energy—are other possible partners. We might hesitate over the safety risks of nuclear, especially for such a volatile region, but the Nuclear Nonproliferation Treaty provides a framework for safe co-operation over nuclear energy.[60] No, this path won't be easy either, and we should be just as on guard for pro-innovation bias here as we should have been for oil and gas extraction.[61] And surely, if the United States is worried about the security of nuclear energy facilities, then presumably it would prefer to help build them itself, rather than China or Russia doing so.

A fifth round of negotiations over protecting marine biodiversity in areas beyond national jurisdiction (BBNJ) just ended in New York City, without an agreement.[62] Countries like Canada tend to advocate for the most ambitious levels of protection possible for the global high seas.[63] As great as that sounds, we only have to look around at the homes, food, cars, electronics, and plastics that we either already have or that we want in order to understand the magnitude of our global resource challenges. But we really do need to protect our most important ocean ecosystems around the world, and the SCS is one of them. In the best-case scenario, all countries agree to stop drilling for oil and gas in the SCS and instead we devote

[57] Brendan Bane, "Small, modular reactors competitive in Washington's clean energy future," *TechXplore*, 26 May 2021, https://techxplore.com/news/2021-05-small-modular-reactors-competitive-washington.html.

[58] Nuclear Energy Institute, World Nuclear Power Plants in Operation, August 2022, https://www.nei.org/resources/statistics/world-nuclear-power-plants-in-operation.

[59] Victor Nian, "The prospects of small modular reactors in Southeast Asia," *Progress in Nuclear Energy*, Volume 98, 2017, 131–142, https://doi.org/10.1016/j.pnucene.2017.03.010; Joanne Liou, "After 34-Year Gap, the Philippines has a Nuclear Facility Again," International Atomic Energy Agency, 24 August 2022, https://www.iaea.org/newscenter/news/after-34-year-gap-the-philippines-has-a-nuclear-facility-again; Mai Nguyen, Ho Binh Minh, "Vietnam abandons plan for first nuclear power plants," *Reuters*, 22 November 2016, https://www.reuters.com/article/us-vietnam-politics-nuclearpower-idUSKBN13H0VO; Yiswaree Palansamy, "As 2020 comes a-knocking, whither Malaysia's nuclear power plan?" *Malay Mail*, 3 January 2022, https://www.malaymail.com/news/malaysia/2020/01/03/as-2020-comes-a-knocking-whither-malaysias-nuclear-power-plan/1824208; Eko Listiyorini, "Indonesia Eyes Subsidies, Nuclear Power in Renewable Energy Bill," *Bloomberg*, 6 June 2022, https://www.bloomberg.com/news/articles/2022-06-07/indonesia-eyes-subsidies-nuclear-power-in-renewable-energy-bill.

[60] Jonathan L. Black-Branch and Dieter Fleck (eds.), *Nuclear Non-Proliferation in International Law - Volume III: Legal Aspects of the Use of Nuclear Energy for Peaceful Purposes*, T.M.C. Asser Press: The Hague, 2016, 556pp., https://doi.org/10.1007/978-94-6265-138-8.

[61] Everett M. Rogers, *Diffusion of Innovations*, Free Press, 2003. As Rogers said, "The progress of a scientific field is helped by realization of its own assumptions, biases, and weaknesses."

[62] Edward Helmore, "'Time has run out': UN fails to reach agreement to protect marine life," *The Guardian*, 27 August 2022, https://www.theguardian.com/world/2022/aug/27/united-nations-ocean-treaty-marine-life.

[63] Susanna D. Fuller, Catherine Coumans, Nicole Zanesco, "The high seas provide an opportunity for Canadian leadership," *Policy Options*, 13 April 2022, https://policyoptions.irpp.org/magazines/april-2022/the-high-seas-provide-an-opportunity-for-canadian-leadership/#:~:text=There%20are%20states%20pushing%20for,is%20a%20significant%20step%20forward.

our limited time and effort to conservation and scientific research, multilateral maritime enforcement, alternative energy production, and carbon sequestration.[64]

Oil has been a causal mechanism in up to half of all interstate wars in the past 50 years, more than any other commodity, and second only to territorial acquisition as an economic factor (which, of course, is also in play in the SCS dispute).[65] The commonly seen maps of the SCS hydrocarbons ("fossil" fuels) are maps of death, literally and figuratively. What would happen if we all decide to focus on mapping life instead? (See Figure 8)

I would place my bet on greater benefits arising from abandoning oil and gas in the SCS and focusing on the more valuable marine biodiversity instead. I would also bet that there are more of us who would want this outcome for the SCS over the alternative.[66] And I would wager that if we were all to commit to decarbonizing the SCS in our global effort to reach carbon neutrality by 2050, then the 21st century would be more truly a Pacific century.

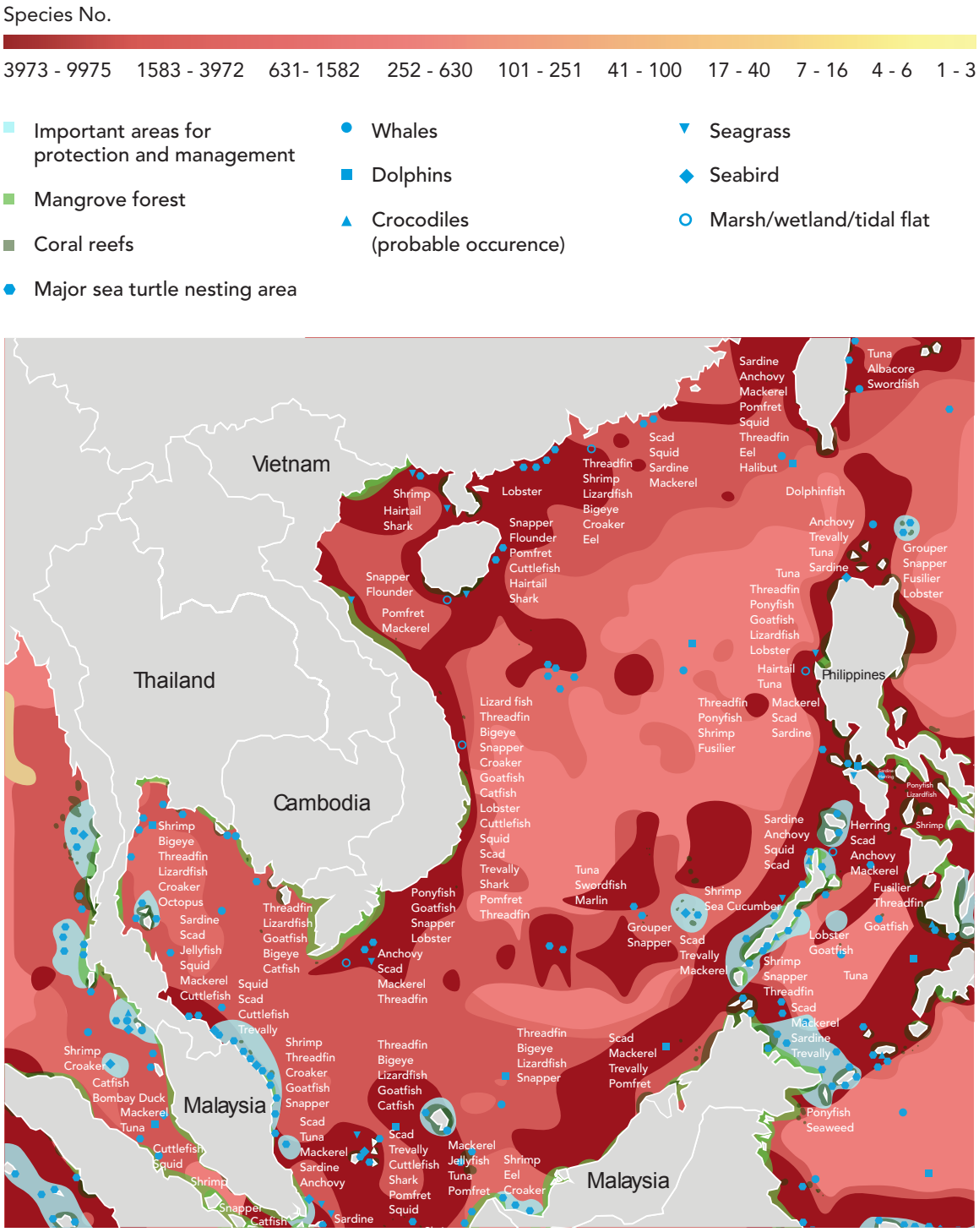
[64] John W. McManus, Kwang-Tsao Shao, and Szu-Yin Lin, "Toward Establishing a Spratly Islands International Marine Peace Park: Ecological Importance and Supportive Collaborative Activities with an Emphasis on the Role of Taiwan," *Ocean Development & International Law*, 41: 3, 2010, 270—280; Yann-Huei Song, "A Marine Biodiversity Project in the South China Sea: Joint Efforts Made in the SCS Workshop process," 26 INT'l J. MARINE & Coastal L. 119 (2011); Ian Townsend-Gault, "The South China Sea Workshop Process and the Need for Taiwan's Continuing Involvement in Regional Ocean Initiatives," in Keyuan Zou and Song Yann-huei (eds.), *Major Law and Policy Issues in the South China Sea: European and American Perspectives*, Taylor & Francis Group, 2014; Keyuan Zou "Managing Biodiversity Conservation in the Disputed Maritime Areas: The Case of the South China Sea," *Journal of International Wildlife Law & Policy*, 18:2, 2015, 97-109, DOI: 10.1080/13880292.2015.1044810; J. Gilbert and C. Dupont, "Microbial Metagenomics: Beyond the Genome," *Annual Review of Marine Science*, Vol. 3, 2011, pp. 347–371; S. Arnaud-Haond, J.M. Arrieta, and C.M. Duarte, "What lies beneath: Conserving the oceans' genetic resources," *Proceedings of the National Academy of Sciences* Vol. 107, 2010, pp. 18318–18324, doi/10.1073/pnas.0911897107; S. Broggiato, S. Arnaud-Haond, C. Chiarolla, and T. Greiber, "Fair and equitable sharing of benefits from the utilization of marine genetic resources in areas beyond national jurisdiction: Bridging the gaps between science and policy," *Marine Policy* Vol. 49, 2014, pp. 176-185, doi.org/10.1016/j.marpol.2014.02.012; D. Leary and S.K. Juniper, "Addressing the marine genetic resources issue: is the debate heading in the wrong direction?" Chapter 34 (pp. 768-785) in Clive Schofield, Seokwoo Lee, and Moon-Sang Kwon (eds.), *The Limits of Maritime Jurisdiction*, Martinus Nijhoff Publishers, The Netherlands, 2014, 794pp.

[65] Jeff D. Colgan, "Fueling the Fire: Pathways from Oil to War," *International Security*, Vol. 38, No. 2 (Fall 2013), pp. 147–180, doi:10.1162/ISEC_a_00135.

[66] Esther Michelsen Kjeldahl and Vincent F. Hendricks, "The sense of social influence: pluralistic ignorance in climate change," EMBO Reports (2018)19:e47185, https://doi.org/10.15252/embr.201847185.

FIGURE 8

Map of SCS Marine Biodiversity



Source: Created by the author and graphic designer Chloe Fenemore, based on maps from Joseph Morgan and Mark J. Valencia (eds.), Atlas for Marine Policy in Southeast Asian Seas, University of California Press, 1984; K. Kaschner, K. Kesner-Reyes, C. Garilao, J. Segschneider, Rius-Barile, T.J. Rees, & R. Froese (2019, October), AquaMaps: Predicted range maps for aquatic species, retrieved from https://www.aquamaps.org; and UNEP/GEF, Establishing a Regional System of Fisheries Refugia in the Gulf of Thailand and South China Sea, http://www.refugia.unepscs.org/.

ABOUT THE AUTHOR

Tabitha Mallory

Tabitha Grace Mallory is the Founder of China Ocean Institute and Affiliate Professor, Jackson School of International Studies, University of Washington. Dr. Mallory specializes in Chinese foreign and environmental policy. She conducts research on China and global ocean governance and has published work on China's fisheries and oceans policy.

Dr. Mallory is an inaugural John H. McArthur Research Fellow, an initiative of the Asia Pacific Foundation of Canada launched in 2021 to provide research opportunities for exceptional, mid-career scholars who are working on programs and research areas with direct relevance to Canada and Canada's interests in Asia. The Fellowship honours John H. McArthur, a world-renowned business educator and former Chair of the APF Canada Board of Directors. Dr. McArthur, who passed away in 2019, was a native of Burnaby, British Columbia, an Officer of the Order of Canada, and Dean Emeritus at Harvard Business School.