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Scientific imaginaries and science diplomacy: The case of ocean exploitation

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Abstract

As technologies of ocean exploitation emerged during the late 1960s, science policy and diplomacy were formed in response to anticipated capabilities that did not match the realities of extracting deep-sea minerals and of resource exploitation in the deep ocean at the time. Promoters of ocean exploitation in the late 1960s envisaged wonders such as rare mineral extraction and the stationing of divers in underwater habitats from which they would operate seabed machinery not connected to the turbulent surface waters. Their promises coincided with others' fears that nuclear weaponry would be placed on the seabed. Those who lacked the technological capability to extract minerals from the seabed also had concerns that other nations would exploit their resources. Scientific imaginaries caused uncertainty in the international community—especially in the “Global South.” The UN called the “Law of the Sea” conferences to mediate emerging geopolitical tensions caused by these imaginaries of exploitation of ocean resources. These conferences became a site where lawmakers projected futures rather than merely responding to past or present dilemmas. Diplomats' negotiations, with their basis in anticipation of the future uses of science and technology, reveal the role of scientific imaginaries within complex negotiations. Here, we see the impact of the distinction (or blurring) of the real and the imagined on the balance of relations between Global North and South increasing global imbalances of resources and power. This article's analysis of

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such scientific diplomacy provides a valuable example of the power of scientific imaginaries to have a global impact.

KEYWORDS

Law of the Sea, ocean science, oceanography, resource security, science diplomacy, scientific imaginaries, UNCLOS

I must go down to the sea again,
 To the lonely sea and the sky,
 And all I ask is an oil rig, an echo-sounder,
 Some drill pipe, a license to explore,
 Some straw bales,
 And a stick to steer 'em by.¹
 —With apologies to John Masefield.²

Science diplomacy is not simply bound to the present; it is also concerned with future projections and influenced by past transgressions. When diplomats consider the potential of future developments in science and technology, their decision-making is often based on entirely imagined scenarios and technologies.³ Forecasts are often at the centre of international tensions and divisions, and this article asserts that sociotechnical imaginaries—as defined by Shelia Jasanoff—have impacted, historically, on science diplomacy.⁴

Science diplomacy is often concerned with imaginings of future developments in science and technology. This requires careful weighing-up of potential future developments within existing sociotechnical imaginaries and their possible impacts on the international diplomatic system. I argue that the seabed politics at the United Nations in the late 1960s and 1970s must be analysed through the lens of sociotechnical imaginaries and their impact upon global science diplomacy. I pay particular attention to how these imaginaries affected the making of international diplomacy and law, and consider their role in intensifying the Global North–South conflict that came to dominate UN diplomatic efforts in the 1970s.⁵ Rather than simply focussing on individual visions of the future, I interrogate four areas of diplomatic tension provoked by ocean sociotechnical imaginaries: the ocean as military space (to stage weapons), as science (to expand knowledge), as resource (to be procured), and as environment (needing protection). These sites of tension emanated from within developed nations during the ad hoc UN seabed committee (1967–1972) and the subsequent UN Law of the Sea III conferences (UNCLOS III; 1973–1982).

The expectations of future science and technology, as formed in multiple national and transnational socio-technical imaginaries, shaped the making of science diplomacy. The ocean imaginaries of the 1960s, rather than heralding a new age of ocean capitalism, deepened the conflict between the industrial countries of the Global North and the developing nations of the Global South.⁶ This discord was driven by the claimed potentialities of an emerging science and technology of the oceans that far outweighed the actual capabilities at the time. The relationship between sociotechnical imaginaries and science diplomacy must be theoretically explored before considering the

¹Hawkins (1970, p. 704).

²Reference to John Masefield's poem "Sea Fever" added when this was quoted in Doumani (1971).

³Colglazier (2018). On futures, see Anderson (2012).

⁴Krige & Wang (2015, pp. 171–179); Connelly et al. (2012).

⁵On the Law of the Sea and North–South conflict, see Payoyo (1997); Pardo & Borgese (1975). On the history of law and the sea more broadly, see Braverman & Johnson (2020).

⁶Legal scholar Surabhi Ranganathan has recently referred to this period as an ocean floor grab in the context of an extractive imaginary. See Ranganathan (2019).

specific case of ocean futures, science diplomacy in the 1970s, and the diplomatic conflict that emerged from these imaginaries.

1 | SOCIOTECHNICAL IMAGINARIES AND SCIENCE DIPLOMACY

In their 2009 paper, Sheila Jasanoff and Sang-Hyun Kim introduced the concept of the “sociotechnical imaginary.”⁷ Jasanoff and Kim define sociotechnical imaginaries as:

collectively imagined forms of social life and social order reflected in the design and fulfillment of nation-specific scientific and/or technological projects. Imaginaries, in this sense, at once describe attainable futures and prescribe futures that states believe ought to be attained.⁸

The connection between scientific-technical futures and nation-states reveals the power that imaginary visions can have. From these visions emerge policies that in turn influence the evolution of technology, government grants, and the relationship between science, technology, and democracy through the inclusion or exclusion of citizens from these projects.

All visions of the future are fiction, and by extension using historical hindsight to study the “accuracy” of such predictions is analytically redundant.⁹ Sociotechnical imaginaries have agency in the moment of their creation and shape policy debates as objects that perform within their specific political-social-cultural contexts.¹⁰ Importantly, they are publicly visible and thus orchestrate change within social systems even when international relations remain unchanged.

As opposed to tired dissections of the accuracy of imagined science futures, a more useful mode of analysis is to study the impact of sociotechnical imaginaries in the context of their creation. As Jasanoff and Kim have suggested, sociotechnical imaginaries fabricate power within the political state that can far outweigh the actual abilities of science and technology at the time.¹¹ Imaginings of technical prowess can far outpace the current state of science and technology, and it is in this blending of present capability and imagined attainable futures that a great deal of power is formed from human imagination.

The concept of the sociotechnical imaginary has emerged out of a recent scholarly turn that distinguishes imagination from mere fantasy or illusion.¹² In doing so, this literature demonstrates that imagination is not a solitary affair, but rather a communal cultural resource that drives social and political activity.¹³ It is founded on collective imaginaries of the future, around which, for example, social, political, and scientific communities are made.¹⁴ The collective shaping of imaginaries is not simply about creating communities, because they also allow states to more effectively control society and “other” those who do not share their same vision.¹⁵ Within the unique political, social, and cultural context of a single nation-state, specific rather than general imaginaries are created. Policies devised in response to such imaginaries “balance distinctive national visions of desirable futures driven by science and technology against fears of either not realizing those futures or causing unintended harm in the pursuit of technological advances.”¹⁶

⁷Jasanoff & Kim (2009). See also Jasanoff & Kim (2015).

⁸Jasanoff & Kim (2009, p. 120).

⁹Koselleck (2004); Rees & Morus (2019, pp. 1–15). See articles in Engerman (2012).

¹⁰Konrad, van Lente, Groves, & Selin (2017, pp. 465–493).

¹¹See Jasanoff & Kim (2015, pp. 10–14).

¹²Sarewitz (1996).

¹³On the development of scholarly understandings of imaginaries of science, technology, and society, see McNeil, Arribas-Ayllon, Haran, Mackenzie, & Tutton (2017).

¹⁴Castoriadis (1987); Anderson (1991).

¹⁵Foucault (1979); Bowker & Star (2000); J. C. Scott (1998). On “othering,” see Said (1978).

¹⁶Jasanoff & Kim (2009, pp. 123–124).

Technologies do not emerge in isolation. There are always multiple technological options being introduced at the same time, but only some are ultimately “successful.”¹⁷ A technology developed in one place is likely to spread quickly, or be used in or against another state, and the loci of technological development might move from an established national centre to an emerging one.¹⁸ Sociotechnical imaginaries are nationally shaped, but if similar sociotechnical imaginaries exist in multiple countries that coalesce around a single scientific objective or technology, then they can be compared transnationally.¹⁹ Jasanoff and Kim focus on the case study of “nuclear power,” and they argue that because each national context is unique, sociotechnical imaginaries only exist at the level of nation-state and that they do not interact transnationally.²⁰ In this paper, however, I argue that when similar technological imaginaries align, they do not create controversy between nations; whereas disagreements over intended uses and futures can spill over into broader international disputes. Where there is discord between nations regarding the use of a technology, the resulting imaginaries—connected by science but divergent due to their ideological and national contexts—will inevitably become a site of conflict in the international arena.²¹ A transnational rather than a comparative approach—as utilised by Jasanoff and Kim—is therefore vital to fully analysing the impact of sociotechnical imaginaries in the global sphere.

While Jasanoff’s and Kim’s approach might be empirically expedient, comparative approaches are cumbersome when studying policy domains that simultaneously act upon many countries. In this article, the example of the future of the ocean and the use of technology to exploit its non-living resources is considered in the years prior to the opening of the third UN Convention on the Law of the Sea. In this case, multiple sociotechnical imaginaries of ocean exploitation emerged in the late 1960s in both developed and developing countries. Although all were slightly different and attuned to national political priorities, commonalities between them drove countries to form “blocs” that were dependent at the most elementary level on whether a state saw the development of ocean technologies as positive or threatening to their national economic development.²²

2 | THE OCEAN AS SOCIOTECHNICAL IMAGINARY

Ocean-centred sociotechnical imaginaries were driven by broader reimaginings of the ocean as a frontier in the mid-20th century. These imaginaries implied to the public, industry, military leaders, and politicians that new scientific knowledge of, and emergent technological capabilities in, the global ocean held great potential. This new technologically driven oceanic age had implications for national security, freedom of marine scientific research, new economic development, and protection of the marine environment.

During the 1960s, nuclear-powered, intercontinental-nuclear-ballistic-missile-carrying submarines had entered the Cold War battlefield, ushering in a new mode of nuclear standoff: the secondary deterrent. By the end of the decade, fears were rising that the next step would be to install permanent nuclear-weapon launch facilities on the seabed. Emerging military capabilities were facilitated by the latest discoveries of marine scientific research. That scientific research seemed to only be in the hands of the powerful industrialised nations and their formidable nuclear navies further stoked North–South conflict.²³

This power disparity became particularly clear with seabed mining, where the potential extraction of manganese nodules drove the perception of technological advances far beyond actual capability.²⁴ During the 1960s, the oceans

¹⁷Nelson & Winter (1977, pp. 36–76).

¹⁸Rip & Schot (2002, pp. 158–176).

¹⁹I am following here the arguments put forward by the editors of the special issue of the BJHS, “Have We Ever Been ‘Transnational’? Towards a History of Science Across and Beyond Borders”: Turchetti, Herran, & Boudia (2012).

²⁰Jasanoff & Kim (2009, p. 124).

²¹See the various articles in Krige & Barth (2006). For an approach bringing IR theory and history of technology together, see Weiss (2005; 2015).

²²Buzan (1976; 1980; 1981); Friedman & Williams (1979).

²³Miles (1998, pp. 99–101). The first underwater bulldozers emerged in Japan in 1969, built by Hitachi and Komatsu in collaboration with the Japanese government; see Trillo (1974, pp. 98–100).

²⁴Hedberg (1976); Bryne (1964); Mero (1965).

emerged as a potential new technological frontier filled with abundant non-living resources. Renewed interest in the oceans and knowledge of their potential simultaneously evolved as a serious diplomatic challenge for the United States and ultimately, through debates at the United Nations, for the entire globe. Edward Wenk Jr., the ocean science advisor to the Kennedy, Johnson, and Nixon administrations, summarised the impact of the possibilities of ocean resource exploitation through the promise of emerging technology: “[I]n an unwitting scramble for riches, Pandora’s Box was opened in terms of such questions as who owns the sea and seabed.”²⁵

This scramble was predicated upon sociotechnical imaginaries of deep-sea marine resource exploitation that utilised *anticipated*—rather than *actual*—new technologies. These imaginaries of immense ocean riches—won from the deep with technology and the determination of ocean roughnecks—were powerful images for developing nations that were often newly independent of colonial rule and desperate to attract foreign currency through resource-based industries, but who had not hitherto been “sea orientated.”²⁶ In an era when the superpowers sought rare minerals such as cobalt to use in the high technologies of the Cold War, caches of minerals took on geostrategic implications.²⁷

Socio-technical imaginaries of the riches of the deep were a global phenomenon insofar as all nations began to see the ocean depths as containing an untapped treasure, but these imaginaries were each shaped by very specific national contexts.²⁸ On the whole, the advanced technological nations perceived this future bounty positively, while the developing world feared a new era of “neo-colonialism” comprised of resource wars and exclusion from this new “gold rush.”²⁹ Developing coastal nations were wary of technologically advanced nations entering their territorial waters to exploit marine resources, fearing how these global powers might wield their technological and economic superiority. This mistrust also came to encompass ocean scientists whose postwar scientific discoveries had initially spawned interest in the seabed.³⁰ This placed science and technology at the heart of diplomatic deliberations concerning the future of the international Law of the Sea.³¹

The ocean was and continues to be an abundant space for sociotechnical imaginaries, and in the 1960s there seemed to be no end to the projects that could be undertaken on and in this seemingly boundless “ocean frontier.”³² In 1964, oceanographer Athelstan Spilhaus informed the Marine Technology Society that the ocean frontiers of the late 20th century were equivalent to the emergent land frontiers of 19th-century America.³³ First had come exploration, then would come occupation, and then humanity would conquer the oceans. Spilhaus was writing from an extremely U.S.-centric position and he was clear about his prediction that “Man is going to colonize the oceans, and it might just as well be *our* men.”³⁴ Although the concept of the “frontier” is not unique to the United States, it was in the 1960s that the concept of an “ocean frontier” first emerged.³⁵

Frontiers are socially constructed imaginaries, a useful device for those who seek to conceive of a space as peripheral, remote from a cultural centre, and often in need of taming.³⁶ This notion of “frontiers” has been contested since Frederick Jackson Turner presented his 1893 paper “The Significance of the Frontier in American History,” in which he laid out his “frontier thesis.” Turner asserted that it was not until the American West was tamed in the late 19th century that the United States truly emerged as both territorially and ideologically whole. Its midlands had been considered an empty, unknown, hostile land ripe for the taking since America’s early European

²⁵Wenk (1972, p. 251).

²⁶Levy (1988); Friedheim & Durch (1977); Vícuña (1978); Amuzegar (1976).

²⁷More often than not, these works only consider resources under the land; see Cantoni (2017); Hecht (2012); Adamson, Camprubi, & Turchetti (2014).

²⁸Barkenbus (1974).

²⁹Young (1968, p. 647).

³⁰Robinson (2014; 2018).

³¹Laughton (1987); Miles (1998); Hollick (1972, p. 3).

³²Pardo (1968).

³³Horsfield & Stone (1972, p. 175). On Athelstan Spilhaus, see *The Experimental City* (Friedrichs & Friedrichs, 2017).

³⁴Spilhaus (1964, p. 993). Emphasis in original.

³⁵Rozwadowski (2004a, p. 315); Hannigan (2016, pp. 19–49); Rozwadowski (2012); Kroll (2008); Rozwadowski (2018, pp. 161–187); Robinson (2018, pp. 225–256).

³⁶Hall (2003, pp. 53–54).

colonisation.³⁷ U.S. historians have focussed their efforts on debunking the “Myth of the Frontier,” but despite scholars' reservations with the term, the “frontier” became and continues to be a powerful imaginary for the United States.³⁸

The frontier was importantly part of the political, public, and popular cultural imaginary during the mid-20th century and especially at the height of the Cold War.³⁹ In the 1960s, outer space became the final frontier, Antarctica the cold frontier, science the endless frontier, and the oceans the last resource frontier.⁴⁰

The oceans became the last frontier of humanity's earthbound exploration. Having conquered, cultivated, (and brutally colonised) the land, the ocean was imagined as a site of potential and innovation. The “ocean frontier,” in the same way as the “American frontier,” was not one single unified imaginary: it was multi-dimensional. To some, its living and non-living resources offered economic riches, but to others it was a space for the generation of new scientific knowledge. Yet, the ocean also offered a technological frontier that would potentially extend new opportunities to companies lacking the capital to engage in the international Space Race.⁴¹

The ocean frontier was a “space” to conquer and, as Spilhaus would imagine it, somewhere that humans would ultimately have to live. It was to be a habitable frontier, just as the American frontier had once required taming, cultivating, and occupying.⁴² As one populariser of ocean technology put it at the time:

To industry it's tin, aluminium, oil, gas, sulphur, iron, coal, phosphorites, manganese, diamonds and gold. To fisheries it's £3,000,000,000 per year. To military & political interests it's battlefields & missile bases. To you & me it's a breath of fresh air & a nice place to make a splash.⁴³

Although the human relationship with the ocean was changing during this time, it was the emerging economic potential of non-living resource extraction from the seabed that became central to sociotechnical imaginaries of ocean futures.

Thus, the ocean frontier, for the United States, Western Europe, and the USSR, was imagined as an industrial resource, a nuclear military battlefield, a site where marine scientific researchers discovered new knowledge, and increasingly as an environment in need of proactive protection. This was framed under the guise that the exploration *and* exploitation of what the sea had to offer was all for the benefit or common heritage of (hu)mankind.⁴⁴ It was difficult to imagine that a nuclearised seabed was truly for the common benefit of humankind. Before access to the deep seabed could be discussed, the delicate issue of the military uses of the Cold War ocean and seabed needed to be resolved between the USA and USSR. While the military dimension of the use of the ocean frontier was present in the background of discussions at UNCLOS III, it was largely defused as a point of contention by the developed nations before the negotiations got underway.

3 | OCEAN AS MILITARY SPACE (TO STAGE WEAPONS)

Concerns regarding naval developments on the seabed during the mid-1960s centred on nuclear objects being placed in or operating on the global oceans. In his famous speech to the UN general assembly, Maltese Ambassador

³⁷This was subsequently published in several journals, but also incorporated in to a later book. For Turner's work, see Turner (1921); for more on the attacks and defences of Turner, see Faragher & Turner (1994); Billington (1966).

³⁸Slotkin (1992); as well as papers in the *Journal of the Early Republic's* 1993 Centennial Symposium on the Significance of Frederick Jackson Turner, including Ridge (1993); Ford (1993); Larson (1993). For an earlier treatment of Turner and American foreign relations, see Williams (1955).

³⁹Engelhardt (1995); Wang (2008, pp. 183–198).

⁴⁰Spiller (2015). Spiller does not discuss the oceans. See Rozwadowski (2018, p. 164) and Kroll (2008) on oceans as the “last frontier.” On Cold War consideration of science on the frontier, see Bush (1945); A. C. Clarke (1960).

⁴¹Horsfield & Stone (1972, p. 174).

⁴²On the development of underwater habitats, see Squire (2017).

⁴³Friedmann (1971, dust-jacket text).

⁴⁴Pardo (1967, pp. 1–3); Rozwadowski (2004b; 2018, pp. 167–187).

Arvid Pardo spoke of the “peaceful purposes of the seabed” and further argued that “disarmament, and, primarily, nuclear disarmament, would preclude the ocean-bed from being militarily exploited.”⁴⁵ The USA and USSR were quick to publicly proclaim sympathy for Pardo’s views, as both countries knew from their own experience of the difficulties of operating in the deep sea that such installations would be extremely expensive.⁴⁶ One ocean scientist believed that the costs of underwater weapon installations would “make the space budget look miniscule by comparison.”⁴⁷ Avoiding an arms race with such grievous potential economic impacts temporarily created what was termed at the time “superpower symbiosis,” in that each power was quick to come to the negotiating table to remove seabed nuclear weapons from both the ocean frontier and the sociotechnical imaginaries circulating in public debate.⁴⁸

Despite U.S. fears that the negotiations might force them to reveal the extent of their existing underwater installations, it became clear that the Soviets only really sought to ban nuclear weapons, as any further restriction towards “peaceful uses” were discouraged by the industrialised nations.⁴⁹ In February 1971, the “Treaty on the Prohibition of the Emplacement of Nuclear Weapons and Other Weapons of Mass Destruction on the Sea-bed and the Ocean Floor and in the Subsoil Thereof” opened for signing in Washington, DC, Moscow, and London.⁵⁰ The Seabed Arms Control Treaty prohibited parties from placing nuclear weapons or weapons of mass destruction on the seabed or ocean floor beyond a 12-mile coastal zone.⁵¹ More importantly, in one swift step it removed the nuclear issue from the discussions on the uses of the seabed at UNCLOS.⁵²

While de-nuclearising the seabed was rapidly achieved, the broader issue of de-militarisation or even disarmament was conveniently sidestepped. Declassified CIA documents show that the U.S. national security state feared that the USSR would push for the complete demilitarisation of the seabed.⁵³ The US already widely deployed fixed seabed military surveillance and monitoring stations, and by the early 1970s the U.S. Navy deployed acoustic anti-submarine warfare listening devices (SOSUS) off its own and allied nations’ coasts.⁵⁴ “Caesar” was placed on the continental shelf off the Eastern Seaboard, “Colossus” on the Pacific Shelf off the West Coast, and “Barrier” and “Bronco” off the coasts of Japan.⁵⁵ With the purpose of monitoring submarines entering and leaving the Mediterranean, the U.S. Navy used long-range SOSUS in the form of the Azores Fixed Acoustic Range (AFAR), consisting of sonars on 130-m towers spaced 35 km apart in waters 300–600 m deep. By the early 1970s, claims were made for “insonifying” the global ocean, opening SSBN submarines up to constant surveillance, which the US was well on its way to achieving.⁵⁶ Militaries utilised emerging technology and new ocean knowledge produced by oceanographers to deepen their underwater operational capabilities.

By 1970, developing countries became suspicious of the ocean activities of developed nations. The knowledge gap between industrialised and emerging nations was widening, and it became apparent that scientific research might well be used as a cover for more sinister marine ambitions.⁵⁷ Meanwhile and quite serendipitously, the data collected by navies encouraged governments and defence contractors to see the ocean as an increasingly accessible and exploitable “environment.” The U.S. Navy operated several projects with industrial and university partners through the Deep Submergence Systems Program and the Deep Ocean Technology Program; the budget for these programs was \$81 million in 1969, a significant part of the U.S. Navy’s oceanography budget.⁵⁸ While certain

⁴⁵Pardo (1975).

⁴⁶Zedalis (1979).

⁴⁷Blakeslee (1969, p. 7)

⁴⁸Barry (1972).

⁴⁹The Soviets initially attempted to include conventional weapons and surveillance systems in addition to nuclear weapons; see “Seabed Arms Control” (Apr. 18, 1969) ACDA-3239 (declassified Jul 2002), available via CIA FOI reading room (https://www.cia.gov/library/readingroom/docs/DOC_0000811675.pdf).

⁵⁰Details of signatories and the full text of the Treaty are available online (<https://treaties.un.org/Pages/showDetails.aspx?objid=080000028010aa4c>).

⁵¹Nixon (1971a, p. 150; 1971b, p. 882); Rao (1972).

⁵²Wenk (1972, pp. 291–293).

⁵³“Seabed Arms Control” (April 18, 1969) ACDA-3239 (declassified Jul 2002), (https://www.cia.gov/library/readingroom/docs/DOC_0000811675.pdf).

⁵⁴Zedalis (1979).

⁵⁵Tsipis & Forsberg (1974); Ball & Tanter (2015, p. 51).

⁵⁶Zedalis (1979, pp. 582–589, 590).

⁵⁷Sanger (1986, p. 127).

⁵⁸Baker & Gruson (1970).

technical details of projects remained classified, in the context of the deepening Vietnam War numerous public relations articles appeared in the trade and popular science press, including *The New York Times*. These articles detailed, in the broadest and often quite sensational terms, the Navy's ambition for underwater bases and commercial spin-off projects. By keeping the work of these programs in the public and political consciousness via the mass media, the U.S. Navy ensured continued funding in the era of NASA's Apollo space program.⁵⁹ This visibility resulted in congressional hearings on the future of marine technology that only stoked further domestic and international interest.

4 | OCEAN AS SCIENCE (TO EXPAND KNOWLEDGE)

After the Second World War, oceanographers of the major maritime powers saw their budgets expand, enlarging the scope of marine scientific research and in particular of military oceanography.⁶⁰ Despite increased resources, it became quickly apparent that some of the really big questions of ocean science, such as understanding global ocean current circulation, required international coordination and cooperation.⁶¹ In the early Cold War, new international scientific conferences, committees, and expeditions provided opportunities for West to meet East.⁶² The aim of international scientific cooperation was to utilise science as a means of defusing international Cold War tension.⁶³ However, this also gave national intelligence networks the opportunity to spy on other nations' scientific programs.⁶⁴ Despite the many ulterior motives for promoting international oceanographic collaboration, international collaboration was the norm by the early 1960s.⁶⁵

As the number of nations actively participating in oceanographic research increased through the 1960s, maritime powers began to shift their science policy focus away from large general international expeditions.⁶⁶ Instead, their attention was on more specialised, expensive, and technologically intensive projects shared among a small group of countries and usually directly controlled by the United States.⁶⁷ These more specialised projects focused on deep-sea drilling, remote sensing of ocean currents and weather, and the beginnings of early satellite oceanography.⁶⁸ These new projects were extremely large, vastly expensive, and open only to the richest nations with trained scientists in a position to collaborate.⁶⁹

The major powers continued national contributions to international scientific coordinating organisations—such as the UNESCO-coordinated Intergovernmental Oceanographic Commission (IOC), and the International Council of Scientific Unions, Scientific Committee on Oceanic Research (SCOR)—in order to uphold the pretence of oceanography as an internationalist and peaceful open science. The most internationally inclusive of these two bodies was the IOC, established in Paris in 1960 with 40 founding members: 7 Central and Latin American, 5 African, and 6 Asiatic developing nations; 17 industrial nations; and 5 Communist countries.⁷⁰ Its stated aim was to “promote scientific

⁵⁹This was because the underwater world offered the closest environment on earth to the hostility of the environment in space and offered aquanauts the opportunity to gather data on living and working in confined spaces that was comparable to the expected experience of astronauts. See Karafantis (2012).

⁶⁰Hamblin (2000; 2005, pp. 32–58); Oreskes (2003); Robinson (2018, pp. 35–73); Sanger (1986, pp. 126–127); Weir (2001); Wenk (1972, pp. 35–92); Hennessy & Jinks (2015); Sontag & Drew (1998). Oceanography was not unique in this regard; see Doel (2003).

⁶¹Hamblin (2005, pp. 99–139); Bates, Gaskell, & Rice (1982).

⁶²Hamblin (2005, pp. 177–216); Sullivan (1961); Behrman (1981).

⁶³Needell (2010); Doel, Hoffmann, & Kremontsov (2005); Turchetti, Naylor, Dean, & Siegert (2008); Kraft & Sachse (2019).

⁶⁴Doel (1997); Krige (2006); Robinson (2014; 2018, pp. 129–135).

⁶⁵Hamblin (2005, pp. 155–159); Camprubi & Robinson (2016); Rozwadowski (2002); Tjossem (2005); Adler (2017).

⁶⁶This is not to say that earlier expeditions had been open to the participation of developing nations. During the International Indian Ocean Expedition, only three developing countries—India, Pakistan, and Thailand—were invited to participate, along with 10 other nations. Most coastal states of the Indian Ocean region were excluded. Sanger (1986, p. 127).

⁶⁷van Keuren (2004); Hsü (1983, pp. 25–33).

⁶⁸Lehman (2016; 2018); Hsü (1992); Horsfield & Stone (1972, pp. 294–312).

⁶⁹Ross (1986, p. 78).

⁷⁰Argentina, Australia, Belgium, Brazil, Canada, Chile, China, Cuba, Denmark, Dominican Republic, Ecuador, Finland, Federal Republic of Germany, France, Ghana, India, Israel, Italy, Ivory Coast, Japan, Korea, Mexico, Mauritania, Monaco, Morocco, Netherlands, Norway, Pakistan, Poland, Romania, Spain, Switzerland, Thailand, Tunisia, Union of Soviet Socialist Republics, United Arab Republic, United Kingdom, United States of America, Uruguay, and Vietnam.

investigation with a view to learning more about the nature and resources of the oceans through the concerted action of its members.” However, the potential of research ships flying the flag of the United Nations was never realised, and the IOC remained a collection of national members pooling unequal resources.⁷¹

Over time, the IOC emerged as an instrumental institution for shifting science diplomatic power from industrialised nations to the Global South. This transferral of control frustrated oceanographers in the Global North and is indicative of the major challenge faced by the science diplomacy of industrialised nations in the late 1960s and throughout the 1970s. For the nations of the Global South, most marine scientific research was self-serving, only paying lip service to any benefit to developing nations. This was a significant driver of discord, as U.S. oceanographer Roger Revelle later lamented:

When we organized the Intergovernmental Oceanographic Commission, its rules were intended to be exclusive, that is, its charter says that membership in the commission will be open to those countries that wish to cooperate in international oceanographic research. To us, that meant having ships and doing oceanographic work in the high seas, big oceanography, big science. It was intended to be cooperation with the Soviets, with the Japanese, with the French, with the Germans, with the Canadians, hopefully with the Indians and Australians and the South Africans. Now the IOC has 120 members, something like that. Most of them are developing countries that don't even know what oceanography is, or know very little about what oceanography is.⁷²

Revelle's use of “we” is telling. Oceanography had hitherto been controlled by the industrial maritime powers of the Global North, who retained their lead in resources, capacity, and scientific power. During the 1960s, the wider international community no longer instinctively took science to be neutral; at the UN Law of the Sea conferences, science itself came “under heavy attack” and was interpreted by some as a weapon in a new age of ocean colonialism.⁷³

During the Law of the Sea negotiations, the delegations of the leading nations of the Global South were wary and sceptical of claims made by the Global Northern maritime powers regarding the internationalism, peacefulness, and future benefits of marine science research.⁷⁴ This suspicion was proven correct following several highly public revelations regarding the use of oceanography as a “cloak of secrecy” by the United States. In 1968, the USS *Pueblo*, a U.S. Navy oceanographic vessel, was captured by North Korea with two civilian oceanographers aboard.⁷⁵ The US claimed that the ship was conducting oceanographic research, but it was found to be equipped with various pieces of surveillance apparatus.⁷⁶ In 1975, it was revealed that the *Glomar Explorer*, the sister ship to the deep-sea drilling vessel *Glomar Challenger*, had been secretly used by the CIA to raise a Soviet submarine in the Pacific.⁷⁷ The entry of many of the major aerospace engineering firms most closely associated with the military-industrial complexes of several NATO countries into the offshore engineering sector further increased mistrust.⁷⁸

Marine science had traditionally been the preserve of governments and militaries, but investment from multinational corporations showed not only that there was money to be made from armaments sales, but also from commercial uses of the oceans. This further highlighted the financial disparity between the leading industrial maritime powers and the rest of the world, whose industry lacked the capital to make such investments. The entangled nature of science and international trade and affairs led to questions concerning the true role and intention of expanded marine scientific research and further disrupted the notion of science as politically neutral.

⁷¹Hamblin (2005, pp. 136, 137).

⁷²Roger Revelle, quoted in Hamblin (2005, p. 139).

⁷³Miles (1998, p. 19); Miles (1969); Friedheim (1965); Alexander (1967).

⁷⁴Gonçalves (1983); Miles (1998, p. 19).

⁷⁵Hersh (1969).

⁷⁶D. P. D. Scott (1977); Evensen (1970).

⁷⁷Burleson (1977); Polmar (2010).

⁷⁸Horsfield & Stone (1972, p. 174).

Financial disparities in the funding of marine scientific research between the Global North and South were stark. In 1967, the year of Pardo's speech, the 10 most industrialised countries spent \$570 million on marine scientific research, operated 453 research vessels, and employed 7,392 marine scientists. The corresponding statistics for Latin American, Africa (excluding South Africa), and Asia (excluding Japan) were 709 marine scientists, 47 research vessels, and a combined budget of less than \$7.5 million.⁷⁹ The distance between developed and less-developed nations seemed insurmountable without the input of the UN and the transfer of ocean technology.

At the UNCLOS conference itself, the scepticism of the Global South came to the fore in the Third Committee, where freedom of marine science to conduct research anywhere on the high seas and within Exclusive Economic Zones was robustly challenged. Leading oceanographic nations felt that if there were restrictions placed on where scientists could conduct research within a coastal state's Exclusive Economic Zone (through a permission system), it would undermine their notion of the "freedom of science."⁸⁰ For developing nations, more elementary questions needed to be considered, such as what constituted marine science, and to what extent basic oceanography differed from applied research.⁸¹ To industrial nations, the focus on these seemingly semantic points constituted a tactic of obstruction by the nations of the Global South that further distanced the two positions.⁸²

The discoveries of marine scientific research had been the catalyst for socio-technical imaginaries of the ocean. They had driven companies, scientists, and science-fiction writers in the Global North to fashion a new human relationship with the seas. Over time, the innocence of marine science was lost as the revelations of the relationship between militaries and oceanographers became more apparent. The duplicity of oceanography as both a driver of ocean imaginaries and a villain of Cold War surveillance and covert activities brought marine science into the global public consciousness. Even though the UN conference on the uses of the seabed was free of military concerns, it became apparent that the duplicity in the use of ocean science made many nations cautious of taking claims of the Global North's intentions at face value, especially concerning the exploitation of resources from the global ocean. Much to the frustration of the maritime powers, marine scientific research entered the agenda of the Third Conference on the Law of the Sea and was picked over time and time again by the conference's Third Committee. For the nations of the Global North, the issue concerned solving emerging problems in the international community through the limitless exploitation of the oceans. For the Global South, conversely, it was a question of finally challenging the hegemony of the North on issues of technological inequality and economic developments. These issues centred on who, how, and for whom the future utilisation of the resources of the global ocean belonged.

5 | OCEAN AS RESOURCE (TO BE PROCURED)

Knowledge of the new economic potential of the ocean came from the rapid expansion of marine science in the developed world in the years after 1945.⁸³ For promoters of ocean science, technology, and resource exploitation, the seas offered far greater potential riches than the remoteness of outer space.⁸⁴ The most prominent "newly" discovered ocean resource was manganese nodules.⁸⁵ They captured the imagination because of the rare minerals they contained and the abundance with which they covered certain areas of the sea floor.⁸⁶ The potential of exploiting such a plentiful resource of rare minerals attracted a plethora of budding investors for the ocean frontier.⁸⁷ In 1960, popular science writer Robert Cowen wrote:

⁷⁹Sanger (1986, p. 127).

⁸⁰Hayes (2011, pp. 161–162).

⁸¹Churchill & Lowe (1999, pp. 403–404). On fundamental and applied research, see S. Clarke (2010, pp. 285–311).

⁸²Hayes (2011, p. 142); Miles (1998, p. 243).

⁸³For literature on the new potential of the oceans, see Loftas (1969); Cloud (1969); Carlisle (1973); Fichter (1978); Rothe (1983).

⁸⁴Steinbeck (1966). Steinbeck had a long association with U.S. oceanographers going back to the early 1940s, but these views were also articulated at the time by Arthur C. Clark; see A. C. Clarke (1960) and Rozwadowski (2012).

⁸⁵Barton (1970, pp. 98–103). However, they were first discovered in the 1870s by the *Challenger* expedition: Sparenberg (2007).

⁸⁶Barkenbus (1974).

⁸⁷Horsfield & Stone (1972, pp. 248–266); Adler (2019, pp. 101–134).

The ocean is like a grab bag stuffed with riches out of which man has been taking only those few packages he can lay hands on easily, often by blindly groping. ... One of the bright promises of oceanography is that an increase in scientific knowledge of the sea will help man systematically to exploit the resources of the marine grab bag.⁸⁸

Yet before the late 1950s, the presence of manganese nodules was known only to a few oceanographers.⁸⁹ Over the course of the 1960s, these “little black marbles” attracted the attention of geologists, the mining industry, governments, international lawyers, and—through numerous articles and documentaries—the general public.⁹⁰ During this time, the status of manganese nodules shifted from scientific phenomenon to a new “world” resource. However, as the chief of mineral economics at the U.S. Department of the Interior wrote in an article in 1968, “the distance from scientific phenomenon to world resource is indeed large.”⁹¹ Although these resources appeared to be very valuable and desirable, their commercial production was far from economically or even technologically feasible.

The dual challenge of extremely high start-up costs along with an uncertain market for seabed manganese was not only a problem for mining companies entering the sector, but also for governments and in particular diplomats charged with devising an international regime for deep-sea mining.⁹² In 1969, the U.S. Commission on Marine Science, Engineering and Resources concluded in the *Stratton Report* that, even with the most favourable technological assumptions, the return on capital invested in deep-sea manganese exploitation would at best be marginal.⁹³ Earlier in 1966, U.S. Steel had run some recovered nodules through its plant and concluded that the cost of extraction far outweighed the market value of the resulting minerals. However, manganese was an important element in the production of steel and the possibility remained tantalising.⁹⁴

The United States was already dependent on imported manganese. The largest reserves of manganese were found in South Africa, Brazil, and Ukraine. Despite being the 12th-most-abundant element in the earth's crust, Western Europe and the United States had exhausted their indigenous supplies and therefore manganese quickly fell under the rubric and rhetoric of Cold War resource security. Lack of national reserves combined with its significance in steel-making meant that manganese was a strategic mineral.⁹⁵ The potential for seabed manganese to overcome this deficiency made it an attractive possible source for U.S. companies and the U.S. government. The need to locate a secure supply intersected with claims that ocean mining would be viable from the 1980s onwards.⁹⁶ This was driven by the belief in the technological superiority of U.S. companies, who were looking to spin off high-tech products originally created for the defence industry for commercial gain. However, the techno-optimism of the U.S. military-industrial complex of the 1950s and early 1960s, which supposed that the US would triumph over all future economic and technical obstacles, faltered as the US entered the 1970s.⁹⁷

Resource security emerged as an arena of conflict during the Cold War as natural resources took on geostrategic significance. This was not simply a matter of specific nation-states gathering resources, as there was wider concern with limiting access to geostrategic minerals for unfriendly nations. Essentially, only global superpowers and their allies had the globally active geoscientific survey and monitoring capabilities required to fight both strategic avenues of this resource conflict: both acquiring and restricting access. In this conflict, the very same accusations levelled at marine scientific research could also be attributed to non-living resource extraction capabilities. These capabilities

⁸⁸Cowen (1960, p. 241).

⁸⁹Brooks (1968).

⁹⁰Cousteau (1973, pp. 24–25).

⁹¹Brooks (1968, p. 401).

⁹²See Miles (1998).

⁹³For the three volumes of reports produced by the commission, see United States Commission on Marine Science, Engineering and Resources (1969b).

⁹⁴Hammond (1974a, pp. 502–503; 1974b, pp. 644–646).

⁹⁵For more on the U.S. search for strategic materials during the early Cold War, see Ingulstad (2015).

⁹⁶See Brooks (1968); Moore (1972). By 1980, the technical question of whether deep-sea mining could be done had largely been answered. But the expense of doing so and the economics of ocean minerals had changed and things seemed uncertain; see Kaufman (1980); Dubs (1986).

⁹⁷On U.S. techno-optimism, see McCray (2013). On the U.S. military industrial complex, see Wolfe (2012). On the 1970s, see Ferguson, Maier, Manela, & Sargent (2011); Borstelmann (2013).

were only open to the richest nations, which had the expertise to exploit such knowledge to the exclusion of developing nations. It became apparent to economically disadvantaged nations that international control was required to slow the widening economic gap that these new capabilities created.⁹⁸

The strategic imperative to monitor and survey sensitive minerals was altered by the perception that emerging technology would make previously unexploitable ocean resources assessable. However, as Miles has argued, the perception at the time of these technological capabilities to exploit these resources far outweighed actual technical abilities—a fact that was known by many at the highest levels of the U.S. administration.⁹⁹ During the 1960s, it was argued by figures like Roger Revelle that the global ocean was essentially a laboratory for humankind, one where experiments were undertaken to understand humanity's place and power on earth.¹⁰⁰ The unexpected consequence of the scrutiny of monitoring and surveying the ocean laboratory and the utilisation of oceanography to further military operational capabilities in the global ocean was a growing realisation of the human impact on ocean ecosystems and the need for international statutory environmental protection.¹⁰¹

6 | OCEAN AS ENVIRONMENT (NEEDING PROTECTION)

The “environment” emerged as a new policy area for governments during the 1960s.¹⁰²

The British became the first to formalise this with the establishment of the Natural Environmental Research Council (NERC) in 1964. This research council funded scientific research on the land, atmosphere, and oceans, underpinned by environmental concerns.¹⁰³ In 1970, France and the United Kingdom both established government ministries for the environment, and in the United States the Environmental Protection Agency (EPA) was formed.¹⁰⁴ Governmental and international legal concern with the marine environment pre-dated the emergence of an environmental movement and the rise of environmental consciousness that was perhaps most closely associated with the 1972 United Nations Stockholm Conference on the Human Environment.

Oil was the most publicly recognised sea pollutant but, according to the Joint Group of Experts on the Scientific Aspects of Marine Pollution established in the wake of the Stockholm Conference, there were four other main pollutants: sewage, pesticides (including chlorinate hydrocarbons such as Dichlorodiphenyltrichloroethane, commonly known as DDT), discharges of metals from industry including mercury and lead, and pollution from radionuclides produced by the nuclear power industry's reprocessing plants.¹⁰⁵ Marine environmental pollution was the dark side of the sociotechnical imaginaries of the ocean, a dystopian imagined future of the potentially catastrophic consequences of pollution that the majority of the international community was keen to avoid. Thus, the ocean became a major site for international policy-making in the era of a new environmental consciousness, as governments and scientists realised the fragility of the oceanic ecosystem.¹⁰⁶

In the decades following the end of the Second World War, significant changes occurred in the maritime world that made pressing the need to protect the global marine environment. As early as 1954, the International Convention for the Prevention of Pollution of the Sea by Oil (OILPOL 1954) was drafted and agreed in London, and entered

⁹⁸On the Cold War geopolitics of resource security, see Adamson et al. (2014); Camprubi & Robinson (2016); Cantoni (2017); Åberg & Fjæstad (2020).

⁹⁹Miles (1998, p. 20). See United States Commission on Marine Science, Engineering, and Resources (1969a).

¹⁰⁰Spilhaus (1955); Revelle & Suess (1957); United States Commission on Marine Science, Engineering, and Resources (1969a); United States Senate Committee on Interstate and Foreign Commerce (1960).

¹⁰¹Adler (2019, p. 156);

¹⁰²Warde, Robin, & Sörlin (2018, p. 18).

¹⁰³The inclusion of “environment” in the title was a compromise. Alternative suggestions made by the leaders of the scientific disciplines incorporated into the new research council each rejected terms put forward from other scientific disciplines. Sheail (1992; 1998).

¹⁰⁴Warde et al. (2018, p. 18).

¹⁰⁵Sanger (1986, pp. 102–105).

¹⁰⁶In the United States, Congress passed the Marine Protection, Research, and Sanctuaries Act of 1972, which required reports to be produced by the National Oceanic and Atmosphere Administration detailing the impacts of marine pollution. In the UK, the Prevention of Oil Pollution Act was passed by Parliament in 1971. The emergence of marine environmental consciousness is discussed in Adler (2019, pp. 135–165); Rozwadowski (2002, pp. 212–244); Hamblin (2009); Müller & Stradling (2019).

into force in 1958 following the establishment of the International Maritime Organisation that year.¹⁰⁷ OILPOL 1954 prohibited the discharge of oily wastes in ports and within a certain distance of land.¹⁰⁸ During these decades, the ocean shipping industry underwent dramatic social, economic, and technological change. The size of ships increased while the number of crew per vessel fell drastically, and most significantly, large amounts of crude oil began to be transported by new “super-tankers.”¹⁰⁹ The risk posed by the increased industrialisation of the oceans—from shipping, factory fishing, and marine mining—progressively came into view as the insights of marine science began to show how fragile the marine environment was when exposed to unrelenting human interaction.¹¹⁰

Several major oil spills, including the tanker *Torrey Canyon* in the English Channel in 1967, the barge *Florida* off Cape Cod in 1969, and the Santa Barbara oil-rig blow-out off the coast of California in 1969, exposed the new and greater risks faced by the marine environment and associated ecosystems. Land-based and atmospheric pollution also leached into the seas. These elements entered the marine food chain, moving up from smaller organisms into fish and marine mammals. In May 1956 in Minamata Bay, Japan, 43 people died, and many suffered blindness, muscular weakness, and brain damage after eating mercury-contaminated fish.¹¹¹ Once the danger of oceanic pollutants reached the dinner table, it became clear that policies needed to be revised.

Recognising that OILPOL needed to be updated to reflect developments in the postwar industrialisation of the oceans, the International Maritime Organization took the initiative from the 1972 Stockholm Conference on the Human Environment to negotiate a new treaty dealing with marine pollution emanating from vessels other than dumping. The eventual treaty, MARPOL73/78, was a landmark piece of international environmental regulation requiring the installation of shipboard and shore facilities to ensure the retention and proper disposal of oil residues. Despite the discussions and treaties negotiated before the first session of UNCLOS III, the marine environment remained a major issue for the conference, placed alongside marine scientific research under the purview of the Third Committee.

Discussion at UNCLOS III (1973–1984) was carried over from the earlier discussions during the Seabed Convention (1969–1971).¹¹² From the earliest meeting of the Third Committee, there was general agreement on the obligation of states to preserve the marine environment. Many states were already party to, or in the process of signing, regional agreements concerned with protecting marine environments.¹¹³ However, various issues quickly emerged. Kenya, on behalf of developing states, argued that the level of preventative measures required should vary in accordance with their state of development.¹¹⁴ Others questioned whether coastal states could impose local standards—as distinct from international—on dumping and vessel-discharged pollution.

These emerging imaginaries of the ocean environment were based on increased scientific knowledge of hydrography of the ocean, the topographical layout of the seabed, and the evolving concept of the ocean as being unified. At the initial meeting of UNCLOS III, the Italian delegate stated “pollution problems affected all countries equally,” an opinion shared by many of the delegates and certainly by ocean scientists.¹¹⁵ In this period, the scale of ocean science as performed in several industrial nations expanded. As marine scientific research became a “big science,” it also developed into an extremely expensive science, and the “pricing” out of several nations of the Global South from the bounty of ocean scientific knowledge sowed seeds of division and conflict.

¹⁰⁷Legault (1971); Shutler (1970); Neuman (1971). No history has yet been produced of the International Maritime Organisation, however a useful guide to its activities during the years covered by this article is provided by Mankabady (1984).

¹⁰⁸In the 1950s, the normal maritime practice was simply to wash ships' tanks out with water and then pump the resulting mixture of oil and water into the sea.

¹⁰⁹Rozwadowski (2018, pp. 153–154).

¹¹⁰Marx (1967).

¹¹¹Churchill & Lowe (1999, p. 331); Harada (1995).

¹¹²Hayes (2011, p. 44).

¹¹³Hull & Koers (1974); Churchill & Lowe (1999).

¹¹⁴“Kenya: Draft articles for the Preservation and the Protection of the Marine Environment” (1974, Jul. 23), A/Conf.62/C.3/L.2 (http://legal.un.org/diplomaticconferences/1973_los/vol3.shtml).

¹¹⁵“Summary Records of Meetings of the Third Committee 5th Meeting” (1974, Jul. 17), para. 31, A/Conf.62/C.3/SR.5 (https://legal.un.org/diplomaticconferences/1973_los/vol2.shtml).

7 | CONCLUSION: IMAGINARIES, GLOBAL AND LOCAL

Despite Jasanoff's and Kim's assertion that sociotechnical imaginaries exist only at the level of the nation-state, they do have the power to transcend borders. One national sociotechnical imaginary can, in another national context, provoke fear, thus shaping a reactionary imaginary that challenges the original in the international arena. Furthermore, sociotechnical imaginaries can be combined or coalesce into large shared visions, when nation-states group themselves in international fora.

In the case of the Law of the Sea, multiple sociotechnical imaginaries of ocean science and technology emerged from a more general reimagining of the oceans during the mid-20th century. These sociotechnical imaginaries were used to proselytise underwater habitats, endless living and non-living resource extraction, and expanded uses of the deep seabed.¹¹⁶ While in developed nations such as the United States these visions positively drove the evolution of ocean politics, in the less developed world these imaginaries and the policies they engendered provoked a more cautious and often negative response.

Developing countries moved to assert their territorial rights to the continental shelf in an attempt to avert a new ocean colonialism. Newly independent nation-states, including those in Latin America, Africa, Asia and Oceania, considered their lack of marine scientific and technical development as a barrier to their ocean economic development. Only through international regulation and control could they benefit in any way from these emerging capabilities. Only by restricting the rights of developed nations—predominately the USA and the USSR—to exploit other coastal nations' marine resources did developing nations feel able to avoid a new age of ocean imperialism.

It was not just in the Global South that nations challenged the sociotechnical imaginaries of industrial nations. For example, the newly independent island state of Malta, through the work of Arvid Pardo and Elizabeth Mann Borgese, attempted to shift the focus towards a global imaginary of peace in the oceans, fearing that these competing imaginaries could be the basis for a new conflict centred on the ocean.¹¹⁷ At the time, Malta's proposals were seen as too radical within the context of the seabed treaty, and Ambassador Pardo was certainly a key part of the shift towards the reconsideration of the machinery of governance of ocean space as a whole, as seen in the Law of the Sea Conventions.¹¹⁸ As a small nation, Malta was never able to fully take the initiative and lead the policy agenda at the UNCLOS as Pardo dreamed of. This island nation did, however, foster its own NGO, the International Ocean Institute, which was established by Elizabeth Mann Borgese in 1972.¹¹⁹ NGOs had an unexpected but significant role in the Law of the Sea negotiations, infusing issues such as environmentalism into debates about resource use and distribution.¹²⁰ They often worked together to advocate for causes that seemed very peripheral to the goals of industrial and developing nations' concerns regarding ocean boundary-making.¹²¹ Over time, these NGOs did begin to foster their own visions—indeed imaginaries—of how global ocean governance could be organised. But the oceans never became Borgese's "laboratory for the making of a new world order."¹²² The catalyst for the Third Law of the Sea negotiations was the sociotechnical imaginaries of the nations of the world, and it was their politics that ultimately dominated the final legal settlement. However, it is quite apparent that in any future law of the sea, the concerns of nation-states will sit probably uncomfortably alongside the issues brought to the table by NGOs and similar groups.¹²³

Divergent national imaginings of the uses, capabilities, and purposes of marine science and technology drove the South–North discord that deepened during the later UNCLOS III conferences. It is important to note that key

¹¹⁶Sociotechnical imaginaries of the ocean have recently returned; see Hylton (2020).

¹¹⁷Meyer (2018).

¹¹⁸Buzan (1976, pp. 167–168).

¹¹⁹Borgese (1993).

¹²⁰Parmentier (2012).

¹²¹A trend that has continued. For contemporary examples of NGO cooperation on ocean governance/development issues, see Deepsea Conservation Coalition (<http://www.savethehighseas.org>); Antarctic and Southern Ocean Coalition (<http://asoc.org/>); High Seas Alliance (<http://highseasalliance.org/>). The involvement of NGOs in marine affairs has not been universally welcomed; see Manoa (2009).

¹²²Borgese (1993, p. 4).

¹²³See Harden-Davies (2018); Lubchenko & Grorud-Colvert (2015).

concessions were won as a result of collective action by developing nations at UNCLOS. For example, Article 82 of the Convention exempts “a developing state” from making contribution—either financial or in kind—“with respect to the exploitation of the continental shelf beyond 200 nautical miles.”¹²⁴ As has been shown, the dominant imaginaries of the ocean have their origins in industrialised nations—ones that could realistically envisage moving into the ocean space, had the scientific capacity to create new underwater and surface-based ocean cities, and could conceive of the riches coming from deep-sea resource exploitation by companies based in or aligned to their nation-states. Fundamentally, the ocean politics of the developed nations (the G7) was one of government-industry synergy, as seen in the US’s “decade of marine development.”¹²⁵ For the Global South, an alternative marine future was suggested by these sociotechnical imaginaries, one in which rational management of the ocean space required international stewardship of “the blue marble” by the United Nations.¹²⁶

The accusation of marine imperialism has never fully gone away, nor has the pushback from the Global South against the ocean technological imaginaries of the Global North. A recent article in *The Atlantic* demonstrates that the ocean imaginaries of the 1960s are very much alive today.¹²⁷ Meanwhile, a recent report produced by Greenpeace, “In Deep Water: The Emerging Threat of Deep Sea Mining,” has highlighted the continuing ecological risks of industrialising the seabed.¹²⁸ Two other ocean NGOs, the Deep Sea Mining Campaign and Mining Watch Canada, have recently produced a report that corroborates the findings of Greenpeace but also goes further, highlighting the case of Papua New Guinea (ranked 156 out of 187 countries on the Human Development Index), which had lost \$120 million after it invested in a seabed mining company that subsequently went bankrupt.¹²⁹ The risks for developing countries, of both the environmental impact of ocean exploitation and technological inequalities, led the report to conclude that “Expectations that nodule mining would generate social and economic gains for Pacific island economies are based on conjecture.”¹³⁰ The terms may have changed—diplomats now speak of the “blue economy” and a sustainable approach to marine biodiversity—but the prophets continue to pedal new imaginaries of the ocean future.¹³¹ Once again there are voices warning that all may not be as it seems and questioning the accuracy of the claims being made about the riches to be secured.¹³² Ocean science diplomacy will continue to be a complex and contentious interdisciplinary affair for the foreseeable future.

For science diplomacy, sociotechnical imaginaries can be utilised to set common international goals while also, and often simultaneously, causing fissures that lead to divergent visions of the future that cannot be easily aligned. Science diplomacy is often claimed to be capable of forming collective international visions, yet science diplomacy is also in operation when scientific and technological developments are the drivers for mistrust and reactionary policies. The future is unknowable, yet it is the greatest challenge to science diplomacy. Despite the future’s innate uncertainty, it is vital for historians, science diplomats, and scientists to understand the power that sociotechnical imaginaries have in making the present.

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¹²⁴For contemporary discussion of this, see Harrison (2017).

¹²⁵On the decade of marine development initiative, see Wenk (1972, pp. 368–400).

¹²⁶Poole (2010).

¹²⁷Hylton (2020).

¹²⁸Casson (2019).

¹²⁹Hunt (2020).

¹³⁰Chin & Hari (2020, p. 47).

¹³¹Pauli (2010). For a critique of this literature, see Winder & Le Heron (2017).

¹³²See Barbesgaard (2018); Voyer, Quirk, McIlgorm, & Azmi (2018); Zalik (2018).

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