OCEAN SPACE

# UNFOLDINGS

## A RESEARCH DOSSIER ON SEVEN TRAJECTORIES OF TERRITORIAL AGENCY: OCEANS IN TRANSFORMATION

Thyssen-Bornemisza Art Contemporary Academy

# OCEANS IN TRANSFORMATION

The world ocean is changing, as its energy, circulation, chemistry, and life undergo a major set of transformations. The oceans are enveloped in a millenary shift from a long period of relative climatic stability. The changes leading to a new phase of planetary history are multiple, and they traverse a variety of entities, currents, life forms, environments, and cultures. They operate along a gradient of magnitudes, dimensions, energies, and rhythms.

The arrival of the new geological epoch of the Anthropocene, marked by the effects of human activity on the operations of the earth's complex self-regulating dynamics, is a non-linear event. It is shaped by multiple forces and challenges long-established relations.

How to become sensitive to these transformations? How to make sense of them? How to register and rearticulate them? How to shape polities and cultures that can coexist with the oceans? How to think from and with the oceans?

Oceans in Transformation is a research exhibition developed in collaboration with TBA21–Academy by Territorial Agency, an independent organization that combines architecture, research, and advocacy. The project explores new ways of connecting research groups that address the oceans in transformation, linking science, arts, and politics by way of shared images, datasets, and narratives.

The research project has unfolded over several years through interactions with hundreds of scientists, research institutions, intergovernmental organizations, scholars, activists, policy makers, and artists. It has brought together a group of Ocean Fellows, who during the first months of the Covid-19 lockdowns have further developed the work and its outreach with a wealth of online activities that can be accessed at www.ocean-archive.org.

The project combines Earth Sciences and remote sensing datasets in complex dynamic compositions. These compositions are produced with data from satellites, floating buoys, GPS, artificial intelligence, sonar scans, and climate models of the interactions between sea, sky, and land. Multi-temporal and multi-scalar, they form an image of the oceans as unframed, asynchronous, and discontinuous.

This image of the Anthropocene is organized along seven trajectories stretching across the contemporary oceans and presented on large screens. The trajectories indicate the complex interrelations between forms of the Earth System and forms of human cohabitation. As they span the planet, they reveal the magnitude of the impact of human activity on the oceans. They offer a momentary glimpse into humans' relation to a multiplicity of oceans in transformation, and a premonition about the future of these relationships. They indicate how fragmented and incoherent the knowledge of the oceans still is and form an invitation to collaborate and think together how to safeguard the future of the oceans and their cohabitants.

Text by Territorial Agency

## UNFOLDINGS

A research dossier on the seven trajectories of Territorial Agency: Oceans in Transformation

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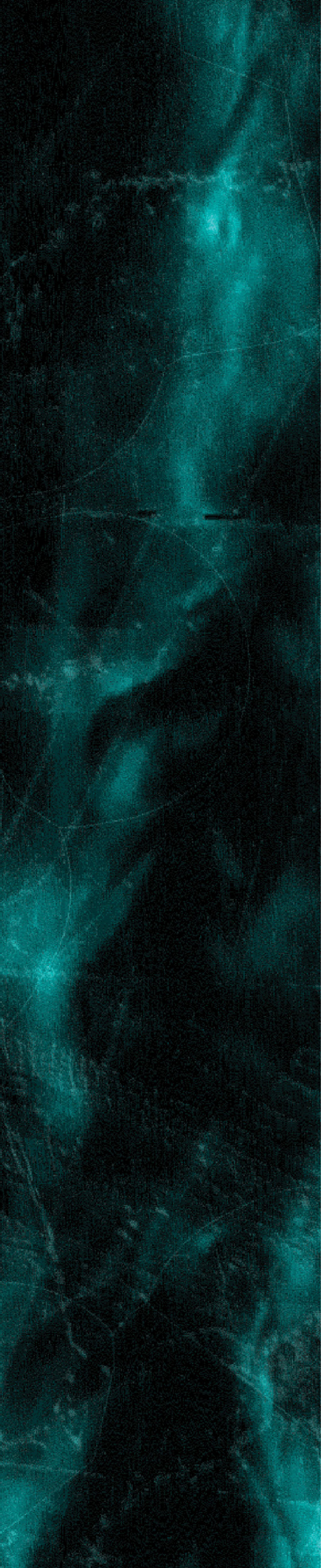




# SENSING THE OCEANS

The ocean is a sensorium, it records in its complex dynamics the transformations of the earth and inscribes its cycles into the patterns of life forms. It is vast and self-regulating, and it is now entering an unstable moment in its planetary history. Oceanic transformations are shaped by the intensification of human impacts on the planetary system. Yet, we are only beginning to understand and to look into the dynamic and sensitive composition of our living planet.

The multi-year research project *Oceans in Transformation,* a collaboration between TBA21-Academy and Territorial Agency, looks at new ways of collaborating to protect the oceans, by bringing together the multiple groups that investigate and measure them. The research explores the ocean as an aesthetic device: it is sensed and detected, navigated and observed, and made sensible to new polities and new forms of collaboration that are trying to compose a new common world for common action.

Complex remote sensing datasets stemming from prominent research institutions are brought together and visualized in novel ways to express the magnitude of oceanic transformations induced by the escalating impact of human activity on the earth. Thousands of sensors constantly monitor the ocean above and beneath the waves: satellites, airborne sensors, and floating buoys are deployed to the ocean, to the seabed, and into orbit to collect and transmit data on ocean currents, salinity, temperature, and acidity. Never before has the ocean been measured to this extent.

As interdependent oceanic components of the Earth System overlap and interact, they form a coherent whole sustained in space and over time, with clear boundaries and durations. Earth System Sciences integrate disciplines and fields of knowledge production to study these forms, both oceanic and terrestrial, as they set out to understand the complex interrelations that characterize the earth as a whole. This whole is embodied in the Gaia hypothesis. The theory that life is regulating the earth has emerged at the same time as the great post-agricultural and industrial acceleration of human activities that characterizes the new geological epoch of the Anthropocene. While the Anthropocene is explored via technologies of environmental surveying, remote observation, and scientific modeling, the same scientific research methods are used for increased exploitation of the Earth System.

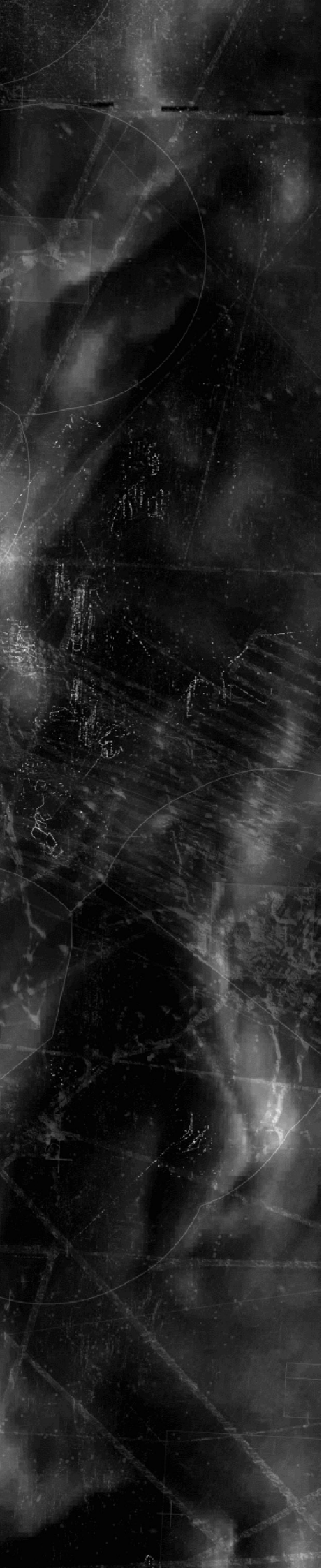
Human space, cultures, and societies develop and consolidate in complex world-systems. The long-term inhabitation of seas, coasts, archipelagos, cities, lands, and shores, intricate networks of communication, and the development of everyday life forms and rituals have a major role in human history, as much as local contingencies and immediate actions.

A shift away from the human-nature duality is the structuring element of *Oceans in Transformation*. We compose different figures of this shift by tracing seven trajectories across the oceans that describe the enmeshed conditions of the vast changes in the world oceans. Together, the seven trajectories are organized along a “score,” a sequence of emergent phenomena which link the Earth System with the world-systems by single and interconnected anthropogenic agencies acting on the oceans over time.

Text by Territorial Agency

**Sensing the oceans** identifies the most pervasive material and conceptual transformations of the world oceans. These are:

Multiple Oceans
Sensible zone
Sea level rise
Atmosphere
Chlorophyll and algae bloom / Eutrophication and Dead Zones
Overfishing
Transport
Extractivism / Deep Sea Mining
Bathymetry / Continental Shelf
Coastal Urbanization / Ecosystems
Climate Justice



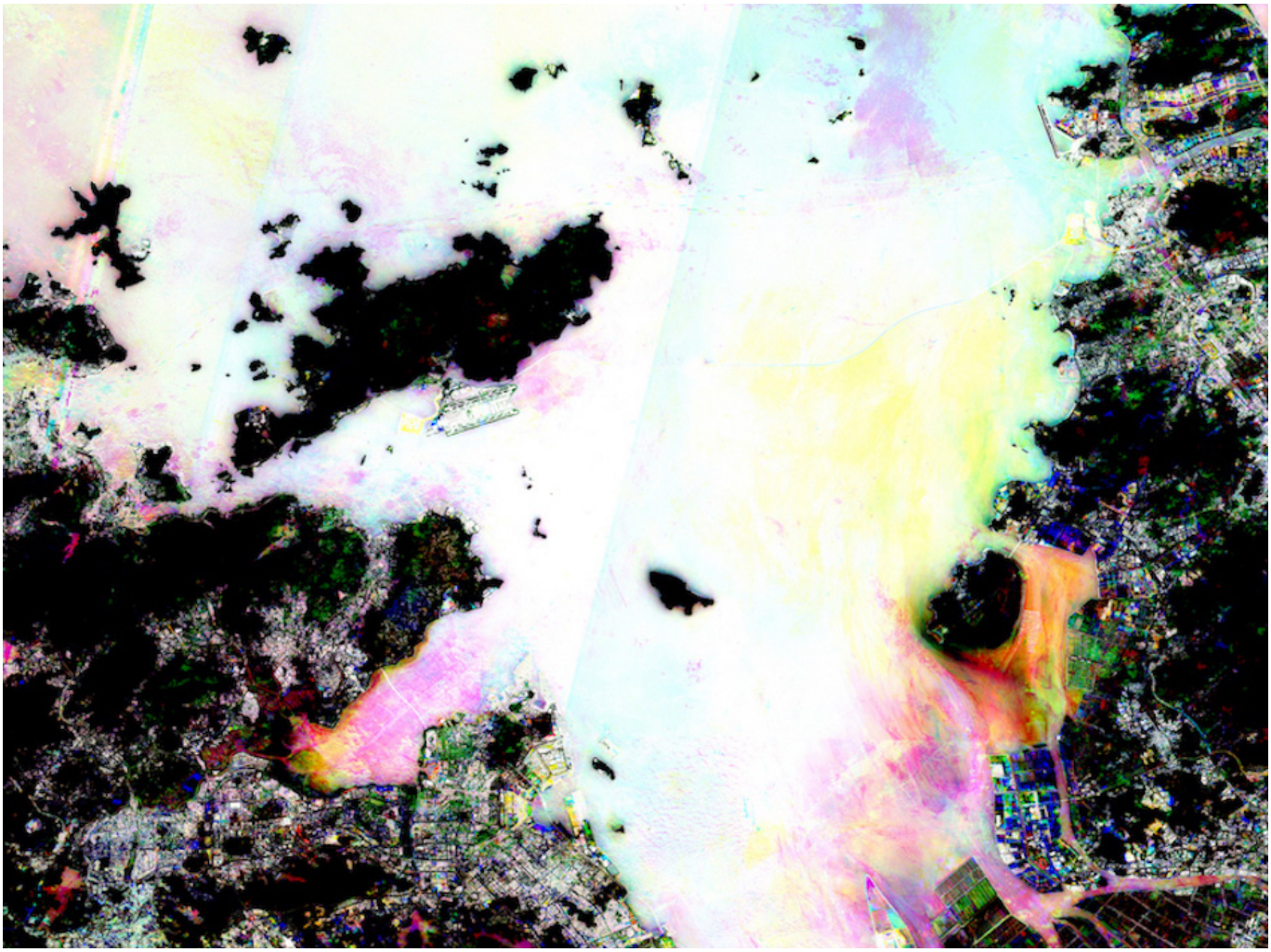


# MULTIPLE OCEANS

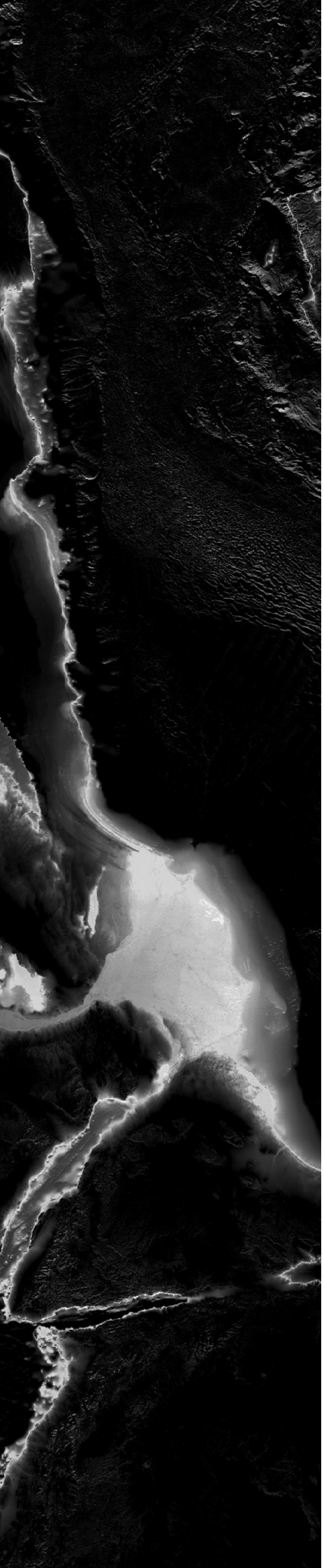
There cannot be a holistic overview of the earth. By the same measure, there is not one ocean—even though there is a meaningful narrative around this notion—but a multitude of oceans, in our view. "The ocean" is a deeply conceptual creation whose boundaries are drawn differently depending on who is demarcating those boundaries. According to the anthropologist Stefan Helmreich, "the ocean is a political concept. And it is also becoming an ecological concept, a biological one—it is a space full of vitality—but it's also a space full of death and forgetting."[1] The multiple transformations of the oceans are sensed and explored in a great number of different ways, each mobilizing specific forms of knowledge and expertise, referring to different logics and imaginaries, and deploying different instruments. These transformations are only ever partially seen, understood, and analyzed. The partiality isn't a condition of divergent points of view on the same ocean, it is the composition of the ocean itself that seems to be plural.

*Oceans in Transformation* takes as a starting point the scientific literature compiled by the recent IPCC (The United Nations Intergovernmental Panel on Climate Change) Special Report on Ocean and Cryosphere in a Changing Climate (SROCC) from 2019. Territorial Agency composed images out of open-access data referred to in the report only to realize that there are very few globally available measurements and models. Most of the data is produced discretely, in various formats, and is often difficult to access. *Oceans in Transformation* analyzes perhaps 5 percent of the globally available open-access data. The rest of the data, about 95 percent of it, is in the hands of scientists and institutions guarding their information. Hence, scientific knowledge of the oceans is extremely fragmented and characterized by growing expert knowledge and proprietary scientific dissemination. This problematizes a general understanding of ocean literacy. There is a divide between the researchers who study fishing and the ones who study bathymetry, between research on shipping and transport, and research on the depletion of ecosystems on coastal lands. Hence, the need to bring disjoined datasets together in new ways to accelerate decision-making to detect illegal fishing, identify animal migration patterns and habitats, improve vessel efficiencies, and move to protect the most viable ecosystems. This aspect of the project encourages new collaborations that can be established between different actors and agencies in order to achieve the necessary and urgent steps to safeguard the health of the oceans.

1. Markus Reymann, "Research as Form: TBA21–Academy's oceanic explorations. A conversation between Stefan Helmreich and Markus Reymann. Cambridge, Massachusetts, November 11, 2019."



↑ Territorial Agency: Oceans in Transformation. Commissioned by TBA21–Academy. Multi-temporal coastal urbanisation and water detection near the Pearl River Delta.





# SENSIBLE ZONE

The main argument developed by Territorial Agency in *Oceans in Transformation* is that the sensible zone is the area that humans have transformed most and has the strongest impact on climate and the future of life forms on the planet.

The sensible zone is a continuous zone covering the planet from 200 meters above sea level to 200 meters below it. In the ocean, it is called the area of the epipelagic or photic zone, that is particularly sensitive to transformation due to intensive human activity and rapid, responsive biogeochemical cycles.[2] Up to a distance of 200 miles from the coast, it corresponds to the securitized Exclusive Economic Zone, where coastal states exploit what is left of the fisheries and the resources of the continental shelf. On land, this is where most of the urbanization, agriculture, and human activity takes place. The sensible zone also acts as the earth's most active layer for biogeochemical cycles, which include the carbon, oxygen, nitrogen, sulfur, and phosphorus cycles, among others.

The sensible zone undoes the separation of land and sea and reconnects these supposedly distinct spaces in a continuum, in a set of gradients of intensity. It is investigated through the complex science of modeling and the recording of the conditions on Earth. Thousands of remote sensors monitor the ocean above and beneath the waves: satellites, airborne sensors, floating buoys transmitting data on ocean current, salinity, temperature, and acidity are deployed into the ocean, down to the seabed, and into orbit. Never in history has the ocean been measured this much. The same arsenal of reconnaissance used to know the oceans is now being deployed to control it. In the digital era, surveillance and the mapping of resource-rich territories and aquatic worlds are at the basis of the increased exploitation of the earth system.

The sensible zone differs from the "critical zone," which French philosopher Bruno Latour defines from a terrestrial perspective, based on erosion patterns on land and river areas. Latour's hypothesis is based on the work of geologist Gail Ashley[3] and has been developed into an exhibition called "Critical Zones: Observatories for Earthly Politics" at ZKM in Karlsruhe. According to Latour, the most adequate way to map this new earth is to view it as a network of critical zones, which constitute a thin skin a few kilometers thick that has been generated by different life forms over eons. Those life forms had completely transformed the original geology of the earth, before humanity transformed it yet again over the last centuries.[4] The critical zone is a "living, breathing, constantly evolving boundary layer where rock, soil, water, air and living organisms interact."[5]

2. The shallow area of the seas seems more sensitive as there is more human activity occurring there, cycling is faster and more responsive, and there are more ways to measure and observe changes. In contrast, the deeper sea environments change incrementally, over longer time periods, and there is little baseline knowledge and almost no long-term data about them. Of course, environments at all depths are interlinked.

3. Gail Ashley, "Where are we headed? 'Soft' rock research into the new millennium," Geological Society of America Abstract/Program 30 (1998): A-148

4. https://zkm.de/en/exhibition/2020/05/critical-zones

5. http://criticalzone.org/national/research/the-critical-zone-1national/

**Changing Biogeochemical Cycles**

"Blue carbon" ecosystems such as mangroves, seagrass beds, tidal marshes, and other marine and coastal vegetated ecosystems are among the most intense carbon sinks on the planet. All in all, the oceans have taken up about 30 percent of total anthropogenic $CO_2$ emissions since the 1980s, which causes increasing surface acidification.[6]

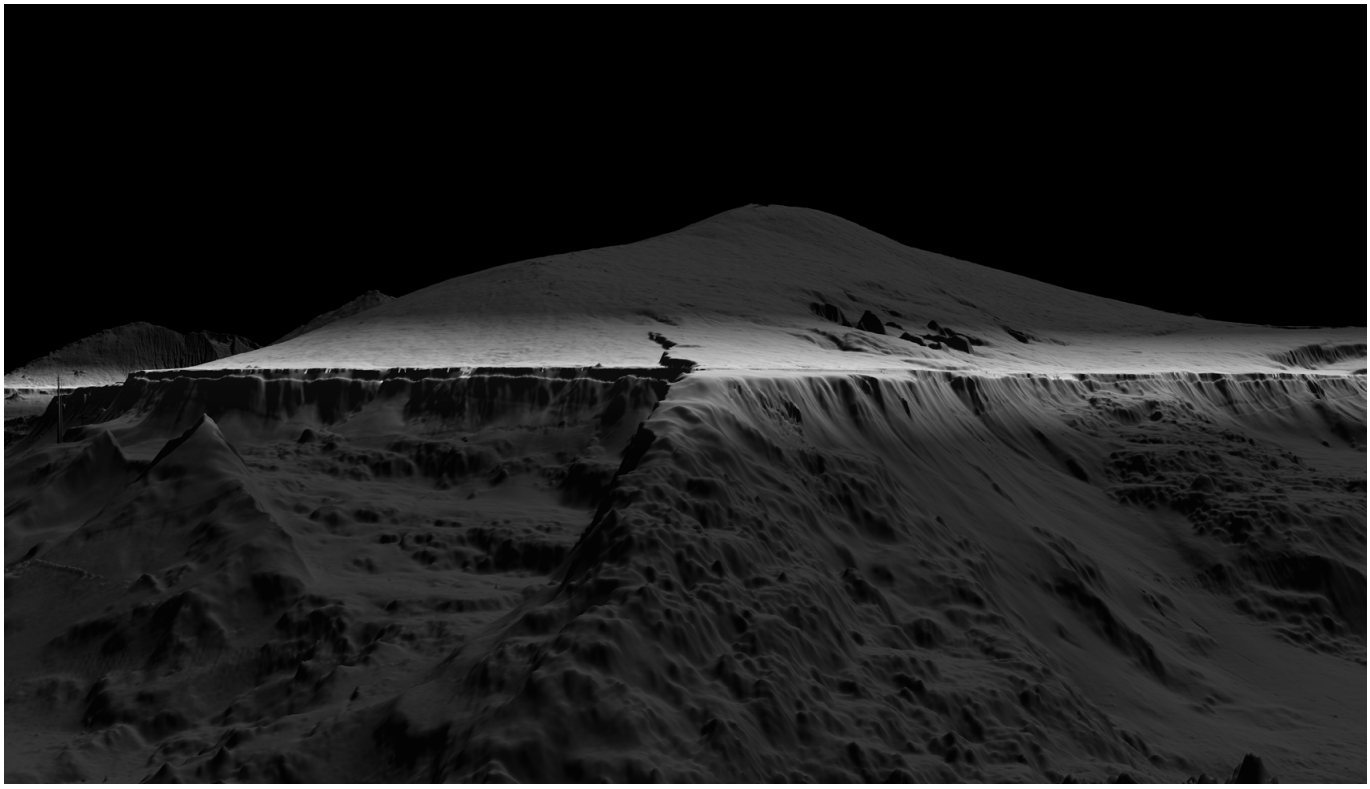
Ocean acidification contributes to various transformations in the habitats of marine life, in addition to the perturbation of marine biogeochemical cycles. In the last century, the pH level of the ocean has decreased from 8.2 to 8.1.[7] More acidic waters present challenges to marine life, including the ability of plankton to produce carbonate shells and skeletons, and alter the nature of sound propagation underwater. The resulting changes to seawater chemistry also diminish the capacity of the ocean to store atmospheric $CO_2$. Warm-water coral reefs and rocky shores largely populated by calcifying (shell- and skeleton-producing) organisms such as corals, barnacles, and mussels are currently impacted by a combination of ocean acidification and extreme temperatures. Marine heat waves have already resulted in large-scale coral bleaching at increasing frequency, causing worldwide reef degradation. Global declines in living coral cover on reefs is highly variable but commonly exceeds 50 percent throughout the Caribbean and Indo-Pacific.[8]

The extraction of fossil carbon, and the subsequent use of energy from its combustion, has disturbed the complex fluxes between the ocean, the atmosphere, and land, to the point that humans have altered the carbon cycle to the edges of planetary stability. The cycle of carbon sequestration, whereby trees, grass, and other plants take up atmospheric carbon through photosynthesis, store it in biomass and move it through the food chain has been completely overwhelmed. Humans are now creating a greater accumulation of carbon residue than the entire biosphere is able to metabolize. Likewise, rapid industrialization has disrupted global biogeochemical cycles that modulate elements needed to sustain life on the planet, such as nitrogen, phosphorus, and iron.

6. SROCC, 2019

7. Hannah Waters, "Searching for ocean acidification signals", Smithsonian (Ocean Find your Blue, December 2012) https://ocean.si.edu/planet-ocean/temperature-chemistry/searching-ocean-acidification-signal

8. Jeremy B. C. Jackson, "Revaluing the oceans", *Oceans in Transformation*, eds. Territorial Agency and Daniela Zyman (forthcoming, 2020).



↑ Territorial Agency: Oceans in Transformation.
Commissioned by TBA21–Academy.
The “sensible zone” in the Hawai’i archipelago.

# SEA LEVEL RISE

Between 1994 – 2017 the Earth has lost a total of 28 trillion tones of ice, showing a 57 percent increase in the rate of global ice loss. Yet, sea level rise is mostly driven by the thermal expansion of the oceans. The energy locked into the Earth System from the burning of fossil fuels warms the ocean and causes the oceans' waters to expand.

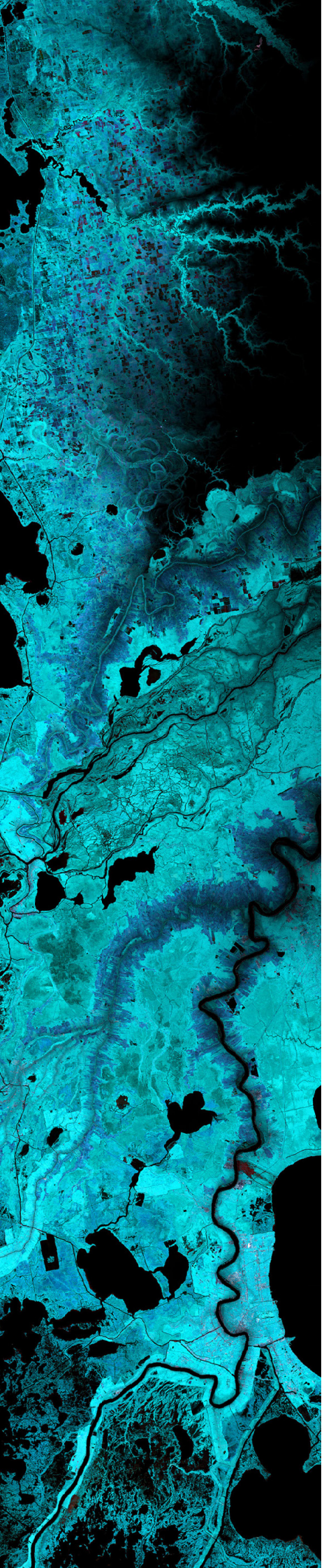
If the global temperature reaches the two degrees Celsius limit imposed by the Paris Climate Agreement, the forecasted global sea level rise could reach a height between 3 and 6.3 meters by the next century. The ocean's increased heat content (or sometimes called the "ocean heat budget," one of the most important indexes for understanding the impact of climate change on the oceans and our future) is the result of greenhouse gases that have accumulated over years and are locked in the earth system. At the moment, global planetary temperature is not anywhere near what the Paris Agreement delineated, and a global temperature rise of 3 or 3.5 degrees Celsius or more is likely. Updated information from IPCC's sixth assessment report is due to be released in 2022, and it should be noted that the uncertainties in the net loss rate of ice were significant in the latest IPCC report, because of sparse point observations, the incomplete knowledge of global glacier area and some scientific disagreement.[9]

Sea levels are primarily measured using tide stations and satellite laser altimeters. Tide stations around the globe indicate what is happening at a local level—the height of the water as measured along the coast relative to a specific point on land. Satellite measurements provide us with the average height of the entire ocean. Taken together, these tools measure the ways sea levels are changing over time. While it can be difficult to measure ice melt, a NASA satellite called ICESat-2, launched in September 2018, is expected to gather enough data to better gauge future changes in the Greenland and Antarctic ice sheets. While waiting for data from the end of 2020, many scientists are forecasting a much more pessimistic prognosis of degradation of the cryosphere.

**Thermal Expansion of the Oceans**

The oceans have taken in more than 90 percent of the excess heat in the climate system. Rising global temperatures are warming ocean waters, and since the 1990s, the rate of ocean warming and marine heat waves have more than doubled.[10] As the temperature increases, water molecules expand, affecting sea level, which is related to changes in the density of seawater, induced by temperature changes (thermosteric) or by salinity changes (halosteric). Thermal expansion was the main driver of global sea level rise for nearly 100 years following the beginning of the Industrial Revolution, though its contribution to sea level rise has slightly declined as the shrinking of land ice accelerated and had a relative cooling effect on the ocean water. Freshening of the water column (halosteric expansion) has been estimated by some to account for about 10 percent of the global average sea level rise in recent decades.[11]

9. IPCC Sixth Assessment Report, SROCC
10. SROCC, 2019
11. https://www.nap.edu/read/13389/chapter/5





Density stratification has increased in the upper 200 meters of the ocean and is inhibiting the mixing between surface and deeper waters. Consequently, oxygen concentrations are declining in the open ocean because the warming of surface waters is occurring faster than the vertical mixing of the oceans, a runaway process that further slows vertical mixing and upwelling of nutrients as lighter surface waters accumulate. The process is especially striking in the Equatorial Pacific and in the Arctic Ocean, where the cover of summer sea ice is rapidly decreasing.[12]

The fact that the ocean is warming quickly increases the rate of melting ice. A clear example can be found in the Atlantic: the Gulf Stream, which is part of the Atlantic Meridional Overturning Circulation, is becoming weaker while the effect that the interaction between the cold water of the Arctic and the warmer waters of the Atlantic is changing. This causes a decrease in marine productivity in the North Atlantic, more storms in Northern Europe, less Sahelian and South Asian summer rainfall, and an increase in regional sea level along the Northeastern Coast of North America.

**Melting Ice Sheets and Caps**

The equivalent of at least 65 meters of sea level is stored in glaciers, ice caps, and ice sheets. The Greenland and Antarctic ice sheets store the equivalent of about 7 meters and 57 meters of sea level, respectively.[13] Glaciers and ice sheets respond to climate factors and processes acting at the upper surface as well as at the base, where glacial meltwater and the properties of the bedrock affect the rate of ice flow, and, in many locations, at the marine margin, where iceberg calving and melting occur.

The melting of ice sheets is one of the primary contributions to sea level rise. Sea surface temperatures are rising globally but disproportionately, with the greatest increases in polar seas and temperate semi-enclosed basins. The melting of Greenland ice accounts for about 70 percent of global sea level rise (excluding the ocean's thermal expansion). According to the SROCC, the mass loss from the Antarctic ice sheet tripled in the last ten-year observation cycle (2007–16) and doubled in Greenland (compared to 1997–2006).

Scientists worry most about Antarctica because of its size and the fact that it contains 90 percent of the earth's ice. A portion of this ice sits on land that is below sea level or as ice shelves that are rapidly shrinking, which means that it is impacted by ocean currents, which accelerate melting. The warming ocean has already begun to percolate into the deep roots of these ice shelve bases, eroding them from below, which is causing huge portions of ice sheets to collapse into the ocean.

12. Jeremy B. C. Jackson, "Revaluing the oceans", *Oceans in Transformation*, eds. Territorial Agency and Daniela Zyman (forthcoming, 2020).

13. "3 Contributions to Global Sea-Level Rise." National Research Council. 2012. Sea-Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future. Washington, DC: The National Academies Press. doi: 10.17226/13389. https://www.nap.edu/read/13389/chapter/5

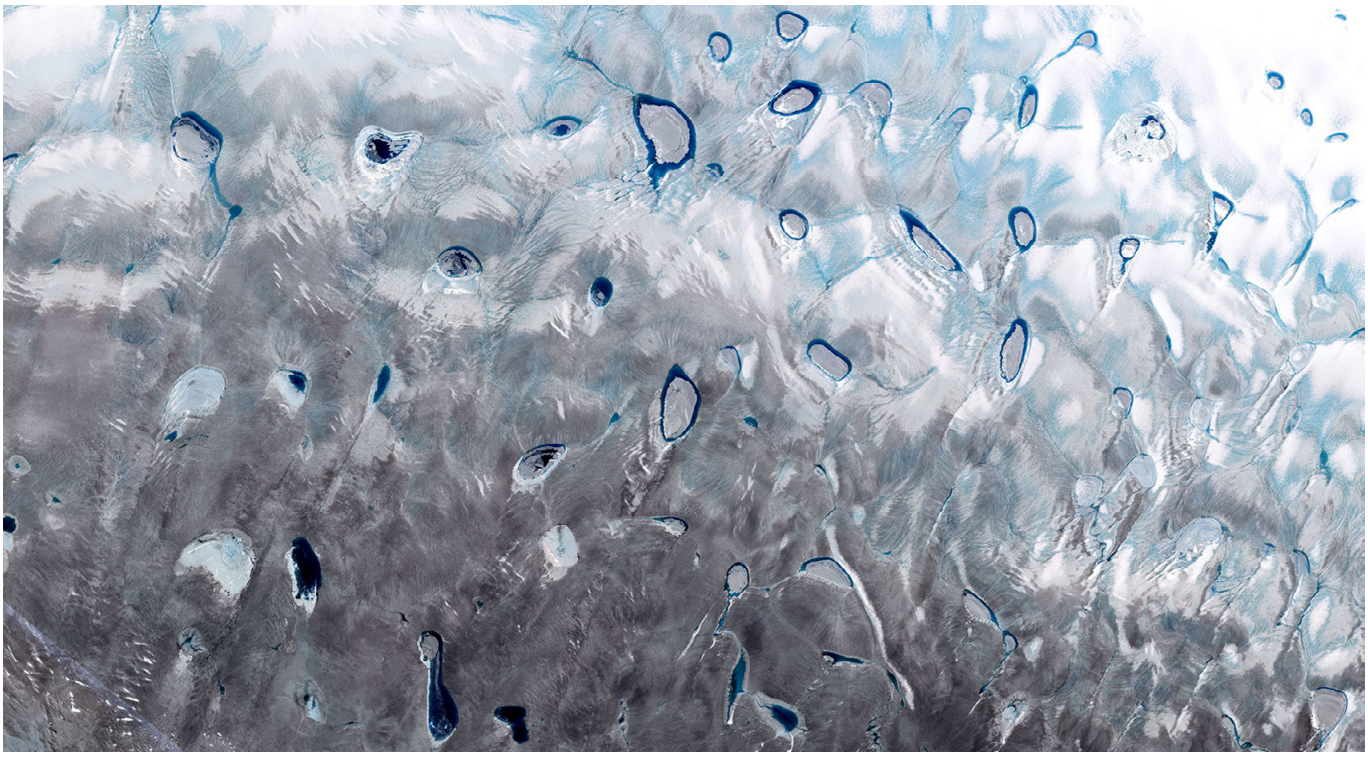
↑ Territorial Agency: Oceans in Transformation. Commissioned by TBA21–Academy.
Houston, Texas: multi-year transformation of metropolitan area and future sea level rise.
© Territorial Agency

**Melting of Ice on Land**

The Randolph Glacier Inventory (RGI) is a globally complete collection of digital outlines of glaciers, excluding the ice sheets, developed to meet the needs of the IPCC for estimates of past and future mass balance. It contains outlines for about 198,000 glaciers and covers a total glacial area of about 730,000 km$^2$.

The major land areas covered with ice are Antarctica and Greenland, followed by the glaciers of the big mountain ranges such as the Himalayas, which bring water down into both the Indian Ocean and Pacific Ocean. The melting of glaciers in the Alps brings water to the Rhine and the Rhone Rivers, as well as the Po and the Danube. In the Northern hemisphere, ice is melting on the Rocky Mountains and on the permafrost in the Arctic and Subarctic.

As the Arctic Ocean temperature increases, warmer water in a weaker current is in direct contact with the Greenland glaciers, which are melting from beneath. There have been fewer than five scientific missions to the North of Greenland, where glaciers are in direct contact with the water. If the melting accelerates, it could mean that Greenland ice will be lost within thirty years. A calculation based on remote sensing data of the mass of water stored in the Greenland ice sheet calculates a potential sea level rise of 7 meters. Current models indicate that we are very close to the so-called tipping point. The other major source of preoccupation is the “doomsday” Thwaites Glacier in Eastern Antarctica with a similar situation. At times, Thwaites Glacier has been called the “cork” for its role in preventing the melting of glaciers around and behind it.



↑ Territorial Agency: Oceans in Transformation.
Commissioned by TBA21–Academy.
Melt ponds on the ice sheet of Greenland, ESA Sentinel data elaborated by Territorial Agency

# ATMOSPHERE

There are many feedback mechanisms between the oceans and the atmosphere. Evaporating water, for example, can condense in the atmosphere to form clouds. These mediate both incoming and outgoing radiation and so determine the temperature of the ocean surface.

As the oceans warm and sequester more heat energy, a global increase in the intensity of the strongest storms has been observed in recent decades. This rise is well-documented and consistent with models projecting future climate. Warmer air holds more moisture, feeding more precipitation from all storms including hurricanes, tropical cyclone winds, and monstrous waves, significantly amplifying extreme rainfall and increasing the risk of flooding and coastal hazards.[14] Sea level rise has dramatically extended the storm surge driven by hurricanes, for example, which is the main cause of damage for coastal regions. Climate change has been found to have significantly increased the rainfall in tropical cyclones. Heat is only one of the drivers of the transformations of the oceans into conditions of incalculability. Acidity is another one. Around thirty percent of all anthropogenic carbon dioxide emitted mixes with seawater. When water and $CO_2$ from the atmosphere combine to form carbonic acid ($H_2CO_3$), hydrogen ions—whose concentrations calibrate seawater acidity—are released. (Higher hydrogen concentrations mean higher acidity, or lower pH).[15] Warming and acidification affect key biological and biogeochemical processes and induce ecological regime shifts, associated with severe losses of biodiversity and an increased vulnerability to all species.

**El Niños and La Niña Events**

A study published by Imperial College London examined data from thirty-three El Niño years dating back to 1901.[16] It found that since the 1970s, El Niños—the periodic warming of the Pacific Ocean that can change weather patterns globally—have been forming farther to the west in the Equatorial Pacific, where temperatures are warmer. Strong El Niños can cause severe droughts in dry climates, such as Australia and India, intense flooding in wetter climates like the Pacific Northwest and Peru, and cause more hurricanes to form in the Pacific and fewer in the Atlantic. Before 1978, twelve of fourteen El Niños formed east of the International Date Line. Since 1978, all eleven have formed in the Central or Western Pacific Ocean, with three extreme El Niño events occurring since the shift—in 1982, 1997, and 2015. All three years broke new average sea temperature records and triggered catastrophic disasters. Scientists also found about 75 percent of extreme La Niña events to occur immediately

14. "Intense Cyclone, Hurricane, Typhoon Frequency Increase." Climate Signals Beta. (April 15, 2020) https://www.climatesignals.org/climate-signals/intense-cyclone-hurricane-typhoon-frequency-increase

15. "Ocean Acidification," Smithsonian Ocean Portal. http://ocean.si.edu/ocean- acidification.

16. Bin Wang et al., "Historical Change of El Niño Properties Sheds Light on Future Changes of Extreme El Niño", *Proceedings of the National Academy of Sciences* 116, no. 45 (5 November 2019): 22512–17.

after an extreme El Niño event.[17] This implies that affected regions experience opposite extremes from one year to the next.

**Monsoon Shift**

Other weather systems are also expected to shift. The Indian Ocean, the only ocean in which currents and winds reverse direction during monsoon season, is at the front line of global transformation. The word "monsoon" appeared in English first in the late sixteenth century, derived from the Arabic *mawsim* (season). The monsoon is actually a seasonally reversing wind accompanied by corresponding rainy and dry seasons. The monsoon allowed for the traversing of the Indian Ocean since its earliest navigation. The late-fifteenth-century Arab navigator Ahmad Ibn Majid recorded this nautical knowledge in an early treatise indicating how regular and predictable the sailing schedules were for each of the Indian Ocean's seas.[18] The riches of the Indian Ocean prompted the Portuguese to seek a sea route around Africa, which they did in 1498 when Vasco de Gama sailed with the help of an Indian pilot from East Africa to Calicut in Kerala, India. Since that date, Portuguese, Dutch, English, French, and Danish merchants sailed in its waters.[19] As Amitav Ghosh reminds us in the poignant study *The Great Derangement*, the origins of global heating are linked inextricably with the history not only of capitalism, but of imperialism and colonialism. Hence, "derangement" is foremost an epistemological crisis born at the same moment that the "accumulation of carbon in the atmosphere was rewriting the destiny of the earth."[20]

**Atmospheric Pollution**

The makeup of anthropogenic atmospheric pollution has varied according to developments in industry, agriculture, and transport, with endless point sources now adding to the ghostly mix of SOx and NOx, ozone, ammonia, particulate matter, and greenhouse gases suspended barely above the earth's surface and waters. Although largely generated and concentrated in urban areas on land, pollutants extend their reach far beyond the local as they are rapidly transported across continents, resulting in air inequality: the groups and communities generating the least air pollution are most likely to suffer from its harmful impacts. An estimated 4.2 million deaths each year are directly attributable to outdoor air pollution.[21] The damage caused to life underwater is hardly measurable but is doubtless colossal, since the physicochemical pathways followed by many airborne pollutants lead into the ocean.

17. Charles Q. Choi, "La Niña Events May Spike with Climate Change", Live Science. (January, 2015). https://www.livescience.com/49572-la-nina-events-increase-climate-change.html

18. Prasannan Parthasarathi, ed., *Indian Ocean Current: Six Artistic Narratives* (Boston: McMullen Museum of Art, Boston College, 2020), 142.

19. Ibid., 2.

20. Amitav Ghosh, *The Great Derangement: Climate Change and the Unthinkable* (Chicago: The University of Chicago Press, 2017), 7.

21. 'Air pollution' – World Health Organization, https://www.who.int/health-topics/air-pollution#tab=tab_1

Even with advances in remote sensing technologies,[22] the multi-layered and necessarily international task of quantifying the many fugitive sources, forms, and products of air pollution, in addition to its complex interactions with the climate system, is as challenging as regulating its release across sectors. Hardly visible nor tangible once dispersed, yet felt violently, the nature of airborne hazards has become somewhat easier to comprehend since the onset of the Covid-19 pandemic in late 2019 – itself exacerbated by the presence of pollution.[23] Anything but ambient, the spectre of global heating continues to loom over the planet, increasingly touching patches of places in the form of climatic events and altered feedback loops, and effecting local to regional transformations.

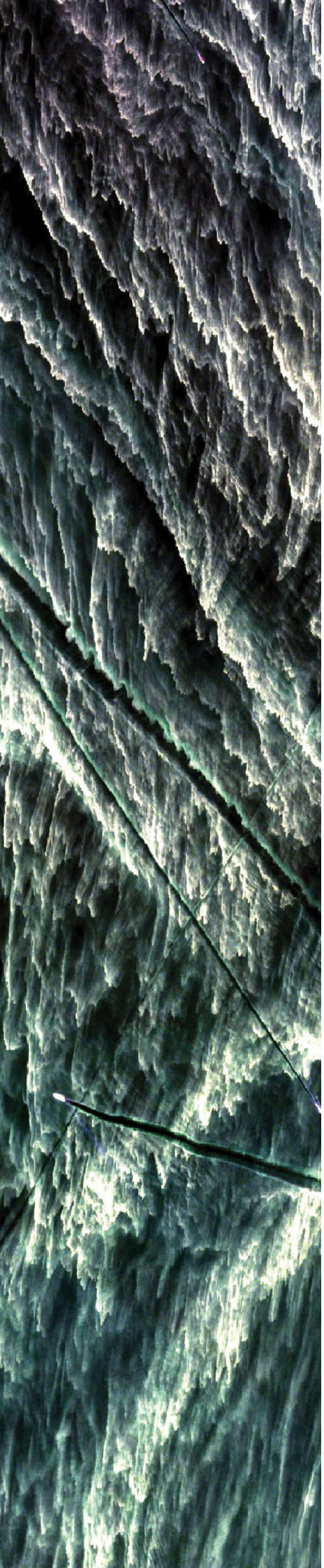
For instance, there has been a continuous warming of the "warm pool" in the central-eastern Indian Ocean over the past half century, which impacts the thermal contrast that drives monsoon circulation. A satellite study revealed the infamous atmospheric "brown cloud" covering most of the Bay of Bengal and the Arabian Sea, suggesting that it is not just a source of pollution but also a factor responsible for changes in the pattern of rainfall over South Asia.[24] The Indian Ocean Dipole—an aperiodic oscillation of sea surface temperatures between positive, neutral, and negative phases—generates in its positive phase greater precipitation in the Western Indian Ocean region with a corresponding cooling of waters in the Eastern Indian Ocean, which tends to cause droughts in adjacent land areas in Indonesia and Australia. The negative phase brings about the opposite conditions, with warmer water and greater precipitation in the Eastern Indian Ocean, and cooler and drier conditions in the west.

22. Camille Viatte et al., 'Air Pollution and Sea Pollution Seen from Space', Surveys in Geophysics vol. 41, 2020

23. Ingo E. Isphording and Nico Pestel, 'Pandemic Meets Pollution: Poor Air Quality Increases Deaths by COVID-19', CESifo Working Paper No. 8495, 2020

24. Ibid., 146.

↑ Territorial Agency: Oceans in Transformation. Commissioned by TBA21–Academy. ESA Sentinel 5P aerosols in the atmosphere.





# CHLOROPHYLL AND ALGAE BLOOM / EUTROPHICATION AND DEAD ZONES

**Trophic Cascade**

Species diversity in the oceans ranges from 700,000 to a million species, with millions more bacteria, other microbes, and viruses. Much of the biodiversity in the ocean, particularly in the deep sea and the microbial realm, is unknown, with up to 2,000 new species described per year. Since a large extent of the ocean is still unexplored and unmapped, scholars speak of it as an "alien ocean"[25]—a place of unknowability and radical difference out of sight and reach, inhabited by myriads of unexplored life forms. And yet, these life forms are delicately organized through alien kinship and interspecies webs cascading from the extreme macro to micro-levels.

The concepts of "trophic cascade" and "keystone species" emerged in the 1980s as an important step in the ways ecologists have come to view and understand the structure and dynamics of populations, communities, and ecosystems. The terms first entered the scientific vernacular to describe how predators structure entire communities through interactions with their prey. "A trophic cascade is the process by which a perturbation propagates either up or down a food web with alternating negative and positive effects at successive levels."[26] "Keystone" refers to a species that preferentially consumes and holds in check another species that would otherwise dominate the system. The suppressed species could be a competitive dominant (like the mussels suppressed by a starfish in rocky intertidal systems) or coupled to a trophic cascade (for example, sea urchins suppressed by sea otters).[27]

Marine trophic cascades permit the examination of interactions in a four-level web consisting of the piscivore, planktivore, zooplankton, and phytoplankton. The most extensive data available is from coastal ecosystems, including estuaries, marsh and mangrove wetlands, seagrass meadows, kelp forests, and coral reefs, where the dominant predators were historically large animals including some combination of killer whales, sharks, seals, crocodiles, predatory fish like tunas and sharks, and seabirds. Nowadays, most of these animals are so severely depleted as to be ecologically extirpated. Humans have taken their place as the dominant predators at almost all trophic levels above the zooplankton.[28]

25. Stefan Helmreich, *Alien Ocean: Anthropological Voyages in Microbial Seas* (Berkeley: University of California Press, 2009).

26. William J. Ripple et al., "What is a Trophic Cascade?," *Trends in Ecology & Evolution* vol. 31, no. 11 (November 2016): 842–49.

27. Mary E. Power and L. Scott Mills, "The Keystone Cops Meet in Hilo," *Trends in Ecology & Evolution* vol. 10, no. 5 (May 1995): 182–84.

28. Jeremy B. C. Jackson, "Revaluing the oceans", *Oceans in Transformation*, eds. Territorial Agency and Daniela Zyman (forthcoming, 2020).

**Chlorophyll Concentration**

Ocean productivity refers to the production of organic matter by phytoplankton, plants suspended in the ocean, most of which are single-celled. Phytoplankton harvest sunlight, nutrients, and water to convert inorganic to organic carbon, and they supply this organic carbon to other organisms, such as bacteria, that obtain their energy from the respiration of organic matter.[29] Satellites can measure (fluorescent) wavelengths of the surface ocean in order to track the concentration of chlorophyll, the green pigment used to harvest light in photosynthesis. When phytoplankton populations are large, the water appears greener because of high concentrations of chlorophyll. These concentrations respond to both seasonal and climatic long-term changes, such as changes in water temperatures and surface winds, which affect mixing within the water column and the availability of nutrients.

Higher chlorophyll concentrations are observed on the equator, along the coasts and in high-latitude oceans. A major driver of these patterns is the upwelling and/or mixing of high-nutrient subsurface water into the euphotic (sunlit) zone,[30] which typically occurs roughly at 80 meters of depth. Favorable light levels and optimal nutrient concentrations can coincide at the "deep chlorophyll maximum," a depth zone of elevated chlorophyll (plant) concentration that hosts elevated primary production.

Primary productivity is the rate at which autotrophs (primary producers) convert atmospheric or aqueous carbon dioxide to organic material. Primary production via photosynthesis is a key process within global ecosystems, as producers form the base of the entire food web, both on land and in the oceans. The oceans play a significant role in global carbon budgets via photosynthesis. Thus, primary production is largely restricted to the upper, light-penetrated skin of the ocean. Approximately half of all global net annual photosynthesis occurs in the oceans.[31]

**Nitrogen Cycle, Eutrophication, Algae Blooms**

The majority of contemporary agriculture utilizes fertilizers containing nitrates that are produced directly from nitrogen in the atmosphere, no longer from the decomposition of previous life. The excessive use of fertilizers has devastating consequences for the environment and human health, as it contributes to the pollution of groundwater and surface waters in the form of surface and river runoff. Airborne nitrogen oxides emitted by transport, including shipping, also enter the surface ocean and contribute to excessive aqueous nitrate levels. Since nitrogen is a limiting nutrient (i.e. a nutrient that limits growth) throughout much of the ocean, its enrichment can significantly disturb ecosystems by enhancing primary production. The combined effects of ocean warming, marine heat waves, oxygen loss, and pollution are causing eutrophication: extreme phytoplankton (microscopic

29. Daniel M. Sigman and Mathis P. Hain, "The Biological Productivity of the Ocean". Nature Education Knowledge vol. 3 no. 10 (2012):21.

30. Ibid.

31. K. E. Frey, J. C. Comiso, L. W. Cooper, R. R. Gradinger, J. M. Grebmeier, J. -É. Tremblay. "Arctic Ocean Primary Productivity" NOAA Arctic Program, (February, 2017). https://arctic.noaa.gov/Report-Card/Report-Card-2016/ArtMID/5022/ArticleID/284/Arctic-Ocean-Primary-Productivity

algae and microbes) blooming with a biomass that exceeds the capacity of zooplankton and other suspension feeders to consume them. These blooms may be visible as red or green "tides" due to the high concentration of algae. The excess phytoplankton dies and sinks, where it is metabolized by microbes, a process that consumes most of the local dissolved oxygen (hypoxia) or all of it (anoxia). Harmful algal blooms contaminate seafood with toxins, and impact ecosystem structure and function, fisheries, and tourism. The five largest marine ecosystems most at risk from coastal eutrophication are the Bay of Bengal, the East China Sea, the South China Sea, the Gulf of Mexico, and the North Brazil Shelf.

**Hypoxia and Dead Zones**

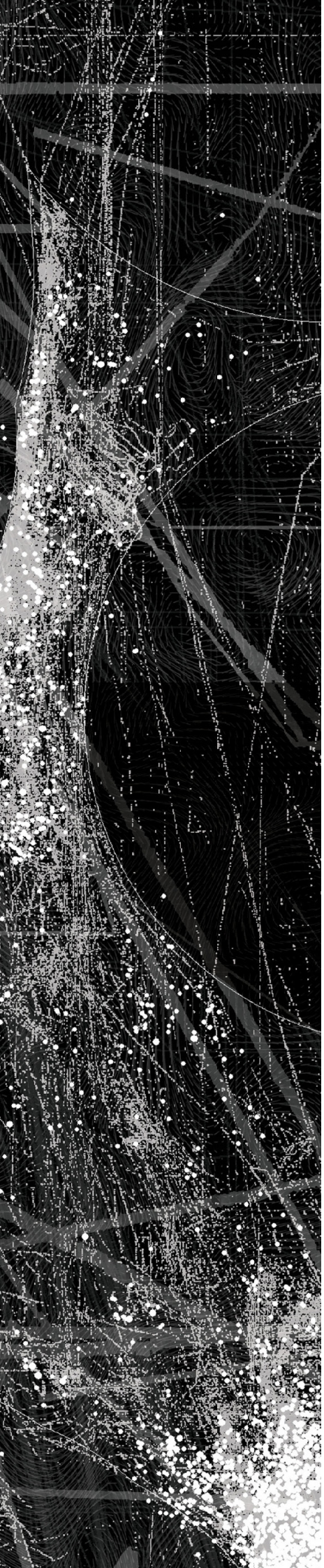
Stratification occurs when fresh water is loaded into the vertical water column, which creates a barrier for mixing as the fresh water sits on top of the denser, saline water. Bottom waters are thus restricted from mixing with highly oxygenated surface waters. When combined, high stratification and high nutrient loading are factors that can lead to the most problematic hypoxic zones.

Hypoxia occurs in aquatic environments as levels of dissolved oxygen fall so low (concentrations of below 2 milligrams per liter) that they are detrimental to aquatic organisms living in the system.[32] Areas in the ocean that experience hypoxic conditions over long periods of time are referred to as "dead zones." In these zones, immobile life forms suffocate, whereas fish, for instance, either leave the area or experience sublethal effects by exposure to hypoxia with negative physiological effects on fish function.

Hypoxia is a large-scale phenomenon: the areas most affected by hypoxia and eutrophication are the Gulf of Mexico, and the quasi-closed Baltic Sea, Adriatic Sea, and the Red Sea. The Persian Gulf has a major dead zone formed by the Indus River, and the Bay of Bengal has been devastated by runoff from Indian and Bangladeshi agriculture. The Yellow River and the Yangtze River equally have impacted the Yellow Sea and the coastal seas of China, while Africa has a major issue around the coast of the Niger Delta.

In total, there are about 500 to 1,000 global dead zones, a figure that continues to grow exponentially, with many in the open ocean. Global temperature rise is causing a greater rate of de-oxygenation of open ocean waters, mainly due to three factors: the fact that oxygen is less soluble at higher temperatures, so less of it dissolves into the ocean; it being consumed by marine life because higher temperatures contribute to higher metabolic rates; and that higher temperatures lead to enhanced stratification, meaning that oxygenated surface water mixes poorly with less toxic bottom waters.

32. "Dealing with Dead Zones: Hypoxia in the Ocean", NOAA. https://oceanservice.noaa.gov/podcast/feb18/nop13-hypoxia.html





# OVERFISHING

Warming and biogeochemical changes in the oceans have contributed to an overall decrease in the health of marine ecosystems and animal life. This loss is currently affecting the pelagic ecosystems at the surface, but it is also projected to incrementally reach the deep seafloor. Overfishing, motivated by the fact seafood is the world's most traded food commodity, with global exports worth more than $ 148 billion in 2014, exacerbates the warming-induced ecosystem impacts.[33]

The biomass of preferred marine fishery species is diminished by an order of magnitude or more, as best demonstrated by the groundfish of the Northwest Atlantic, but equally affecting coral reefs, kelp forests, estuaries, and coastal seas, and even the high seas. Two-thirds of global fisheries are in poor health, overfished, and getting worse, while many of the remaining better-managed fisheries are not yet sufficiently recovered to be economically viable and many stocks continue to dangerously decline. Unsurprisingly, given all of the above, global fish catch is declining in spite of greatly increased conservation effort and subsidies. The losses are greatest for large-scale industrial fisheries, whereas artisanal catches are still slowly increasing. The risks of biological extinction are also increasing for large animals such as whales, pinnipeds, sirenia, sea turtles and large pelagics such as tuna and sharks.[34]

One of the data sets used in *Oceans in Transformation* is created by an organization called SkyTruth. Initiated by geologist John Amos, SkyTruth was one of the first NGOs to use remote sensing and satellite data to identify and monitor threats to the planet's natural resources such as offshore drilling and oil spills, urban sprawl, fracking, mountaintop removal mining, and overfishing. Global Fishing Watch (GFW), initiated by SkyTruth together with Google, uses algorithms to correlate data from the Automatic Identification System (AIS)[35] and Vessel Monitoring Systems (VMS), which are widely used to track fishing vessels and juxtapose their tracks with infrared imaging (to detect potentially illegal "dark vessels" in high seas fishing grounds).[36] Global Fishing Watch has developed an artificial intelligence algorithm that looks at the patterns of movement of vessels and determines whether they are fishing, trawling long line fishing, or transshipping. In their first published report on global fisheries, GFW demonstrated that "more than half of the world's oceans are subject to

33. Kristina Boerder, Nathan A. Miller, and Boris Worm, "Global Hot Spots of Transshipment of Fish Catch at Sea," *Science Advances* vol. 4, no. 7 (July 2018): 1, https://doi.org/10.1126/sciadv.aat7159.

34. Jackson, J. B. C. 2008. Ecological extinction and evolution in the brave new ocean. Proceedings of the National Academy USA 105, supplement 1: 11458-11465

35. AIS is best at tracking larger vessels, used for measuring fishing activity in the high seas, particularly by longline fleets. Most fishing vessels in the world that are over 24 meters broadcast AIS, with this fraction higher in wealthier countries than poorer ones. In Indonesia, almost none of the large vessels broadcast AIS, and similarly in Malaysia, Myanmar, Thailand, and Papua New Guinea. Because the local fleets do not broadcast, the dataset suggests that foreign fleets dominate the region more than they actually do. Also, due to occurrences of piracy near Somalia, many vessels turn off their AIS while fishing the region. As a result, AIS has limited use in the demersal fisheries of the Indian Ocean. See https://globalfishingwatch.org/fisheries/fao-atlas/

36. Chris Elvidge|, "Identification of dark vessels", Global Fish Watch, (June 2018) https://globalfishingwatch.org/research/viirs/

industrial-scale harvest, spanning an area four times that covered by terrestrial agriculture."[37]

The scientific case for closing the high seas to fishing is strong, according to marine biologist Jeremy Jackson. This is because nearly 98 percent of global seafood production comes from Exclusive Economic Zones (EEZs, or the areas within 200 nautical miles of national coasts) of individual nations and aquaculture, with a small proportion coming from fresh water. In contrast, the high seas catch is only 2.4 percent—mostly of luxury species of tuna and billfish—with rather marginal commercial value. Moreover, most high seas fisheries are heavily dependent on government subsidies from a small number of wealthy countries that can afford the enormous costs. Most compellingly, the overwhelming majority of high seas fisheries species are also major components of fisheries within national EEZs, which means that closure of the high seas to fishing would produce a vast Marine Protected Area (MPA) where commercially important species could prosper, reproduce, and spill over into EEZs whose catches would potentially increase. Further advantages would alleviate the challenge of policing the rampant problem of pirate fishing and transfers at sea.[38]

**Illegal and Unreported Fishing**

Illegal and unreported fishing (Also called IUU fishing—that is, illegal, unreported, or unregulated fishing) contributes to overexploitation of fish stocks and is a hindrance to the recovery of fish populations and marine ecosystems. The United Nations estimates over 15 percent of annual global catch is illegal or unreported.[39] Developing nations are most at risk from illegal fishing, with total estimated catches in West Africa 40 percent higher than reported catches. The level of unreported fishing was highest in the Eastern Central Atlantic and lowest in the Southwest Pacific. Such levels of exploitation severely hamper the sustainable management of marine ecosystems.

Studies show a relationship between the level of illegal and unreported fishing, the depletion of seafood resources, and the benefits of improving governance. In Africa, for instance, many coastal countries license vessels from distant nations such as China, Taiwan, Korea, the EU, and Russia to fish in their waters, and many of these vessels contribute to the significant illegal fishing problem. Citing Somalia as an example, research points to the relationship between illegal maritime activities off the coast, piracy by armed militias, and a negative impact on coastal communities. While Somali waters are considered "an El Dorado for fishing fleets of many nations,"[40] the depletion of seafood resources and the presence of international navies have led to a rise in piracy since 2005. "International pirate fishing and organized toxic waste disposal off the Somali coast has deprived

37. David A. Kroodsma et al., "Tracking the Global Footprint of Fisheries," *Science* vol. 359, issue 6378 (February 2018): 904–908.

38. Jeremy B. C. Jackson, "Revaluing the oceans", *Oceans in Transformation*, eds. Territorial Agency and Daniela Zyman (forthcoming, 2020).

39. Food and Agriculture of the United Nations (FAO), 2016 report: "The State of World Fisheries and Aquaculture. Contributing to food security and nutrition for all."

40. Peter Lehr, Violence at Sea: Piracy in the Age of Global Terrorism (London: Routledge, 2006)

the population of the coastal regions of their livelihood."[41] Furthermore, it is assumed that piracy is used as a legitimizing factor for the deployment of EU and NATO navies to establish their presence in the Western Indian Ocean.[42]

Illegal fishing represents a failure of control on behalf of the ship's documented flag state as well as the country in whose water illegal fishing takes place. Furthermore, many vessels are registered with so-called "flag of convenience" states. This means the vessels are registered in (and fly the flag of) a country that may have no true link to their fishing operations. Many countries issuing FoCs are known to sell vessel registrations with few to no restrictions, including Panama, Liberia, and Vanuatu. While these are mostly developing country registrations, the vessels themselves are usually owned and operated by companies in the Global North.

On a world scale, poor enforcement of illegal fishing is pervasive. Only half of the countries (thirty of the top fifty-three fishing countries) assessed for compliance with illegal and unreported fishing regulations in the FAO Code of Conduct for Responsible Fisheries failed (a grade of less than 4/10). Only a quarter (sixteen nations) were rated as "passable" (a grade above 6/10).[43]

**Transshipment**

Global Fishing Watch investigates transshipment events where a fishing vessel offloads its catch to a refrigerated cargo vessel (or "reefer") far from port. To assemble its data, GFW identified all interactions between two vessels that remained within 500 meters of each other for longer than three hours while traveling at less than 2 knots.[44] Most of the species subject to transshipment are high-seas-related species such as tuna, sharks, and billfish, but other species including groundfish, salmon, shark fins, and crustaceans that also get transshipped in both national and international waters. Transshipment increases the efficiency of fishing by eliminating trips back to port for the fishing vessels. This practice obscures the actual source of the catch and is a significant pathway for illegally caught fish to enter the legitimate seafood market. Transshipment introduces concerns about traceability and transparency in the seafood industry. It also causes the accelerated depletion of various fish stock and aggravates protection efforts.

Transshipment vessels often sail under a flag of convenience. In fact, FoCs are flown by 45 percent of transshipment vessels and 40 percent of the potential "rendezvous" are undertaken by transshipment vessels flying these flags. Another 37 percent of likely rendezvous are Russian transshipment vessels, most of which operate within the Russian EEZ at the Sea of Okhotsk. China is one of the major actors in the transshipment occurring in the tropical Pacific and in the Southern Indian Ocean at the moment. Policies on transshipment vary by EEZ, flag state, and geographical region. About 42

41. German Institute for Economic Research (DIW), Berlin, "DIW Wochenbericht 29/2010," (July 21, 2010). See https://www.german-foreign-policy.com/en/news/detail/4998/

42. Ibid.

43. David J. Agnew et al., "Estimating the Worldwide Extent of Illegal Fishing," ed. Stuart A. Sandin, *PLoS ONE* vol. 4, no. 2 (25 February 2009): 4. See https://doi.org/10.1371/journal.pone.0004570.

44. Global Fishing Watch report "The Global View of Transshipment: Preliminary Findings," (2017), 7. https://globalfishingwatch.org/data/.

percent of the potential events occur in the high seas, with the remaining 58 percent within the EEZs of different nations. About a third of the total events occur in the EEZ of Russia, where transshipment appears to be a standard practice for fishing fleet operations. After the high seas and Russia, transshipment is most common in the EEZs of Africa and Oceania.[45]

↑ Territorial Agency: Oceans in Transformation. Commissioned by TBA21–Academy. Anthropocene traces in the Pacific Ocean: fishing and transshipment data near the Nazca-Desventuradas Marine Park off of the coast of Chile.


**Trawling**

A bottom trawl is constructed like a cone-shaped net that is towed (by one or two boats) with a weighted chain along the seafloor. It consists of a net body ending in a codend, which holds the catch and is designed and rigged to catch species living on or near the bottom. Bottom trawls can be operated in a very wide range of depths (from a few meters to 1,500–2,000 meters deep). Bottom trawl physically interact with the bottom sediment, which results in removal or damage of sedentary living organisms (including seaweed and corals) and the displacement of stones or other larger objects. On flat sandy or muddy bottom, the sediments is whirled up into the water column and suspended. Another hugely detrimental impact is the capture

45. Ibid., 9.

of small-sized organisms and non-target species, or bycatch, which are frequently discarded at sea.[46] Seabed trawling for shrimp, scallops, and groundfish transforms biodiverse underwater forests into "depauperate level bottoms of mud."[47]

Recent research by GFW revealed dozens of suspected cases of bottom trawlers operating in Fisheries Restricted Areas (FRAs) that have been designated and approved by the countries surrounding the Mediterranean to protect certain species or habitats. Most of these possible infringements occurred in the Sicily Channel and specifically east of Adventure Bank, where activities in the seabed are banned because it is a hake fish nursery. In 2018, Sea Shepherd Scandinavia revealed illegal fish trawling taking place in the Sound, the strait between Sweden and Denmark, despite the fact such destructive fishing practices were banned back in 1932.[48]

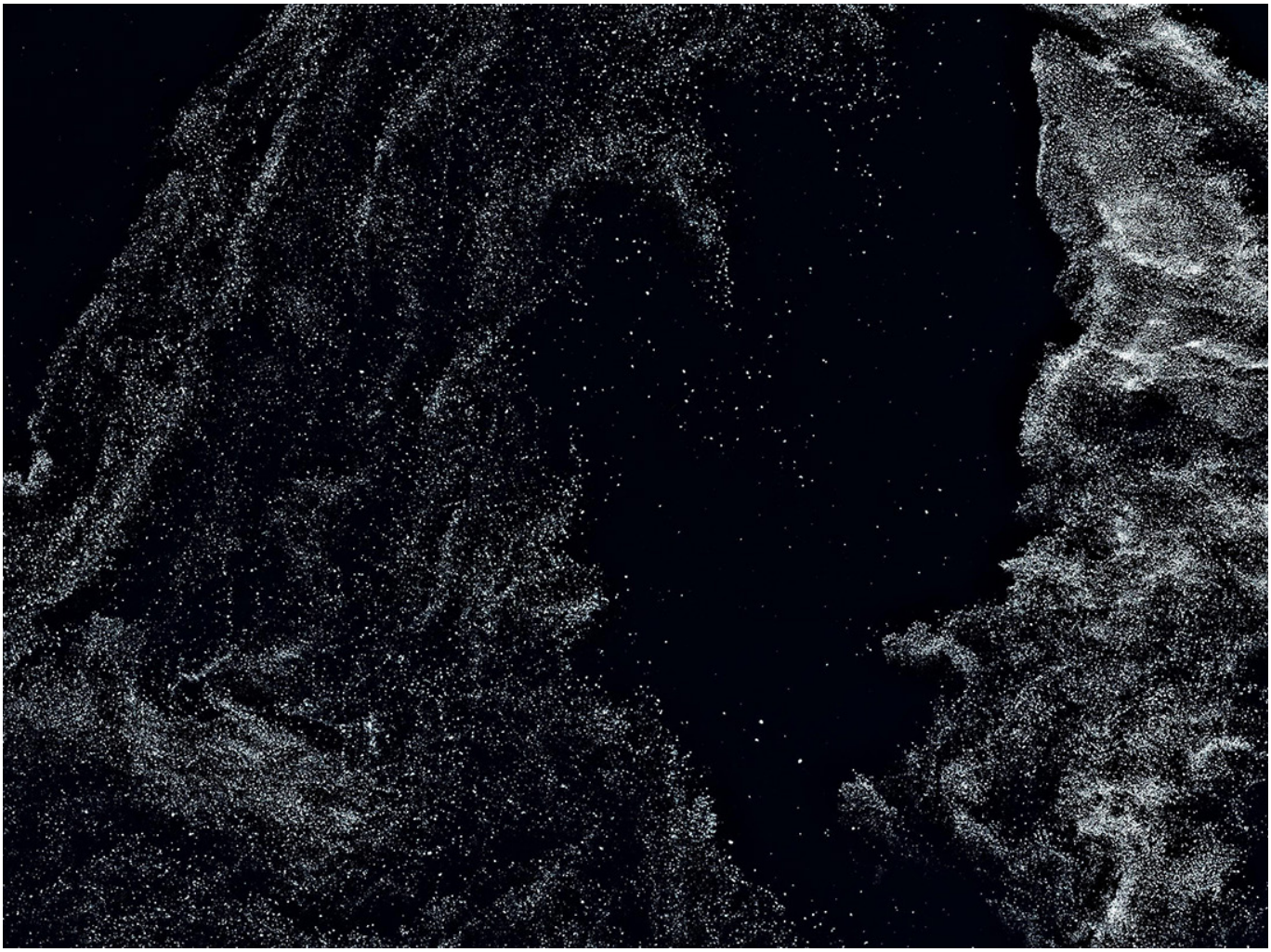
**Shifting Baselines**

Daniel Pauly introduced the concept of the "shifting baseline" to describe the process by which the correct "baseline" of a fishery population is sometimes incorrectly calculated as it draws on data that does not precede human exploitation. Whenever a natural condition is being reestablished, nature is brought back to a condition that humans imagined, a perception that is unaware of the depletion they may have created. The shifting baseline makes the problem of protecting the ocean and its ecosystems very difficult. The goal should not be to restore the ocean to early memories, but to a much more remote condition.

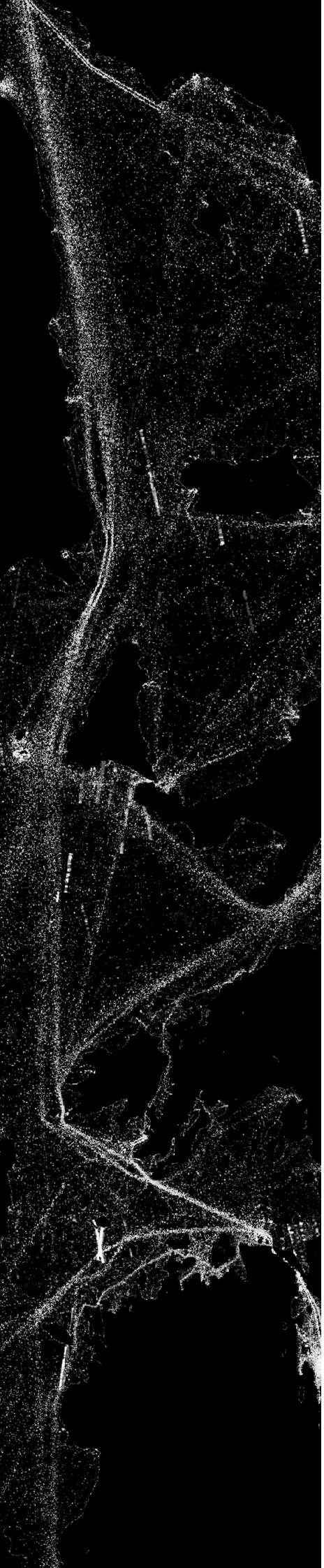
46. Fishing Gear types. Bottom trawls. Technology Fact Sheets. In: FAO Fisheries and Aquaculture Department [online], (September 2001), http://www.fao.org/fishery/

47. Jeremy B. C. Jackson, "Revaluing the oceans", *Oceans in Transformation*, eds. Territorial Agency and Daniela Zyman (forthcoming, 2020).

48. "Illegal Trawling with Impunity Revealed in Denmark's Protected Waters", Sea Sheppard, (April 2018), https://www.seashepherdglobal.org/latest-news/illegal-trawling-denmark/



↑ Territorial Agency: Oceans in Transformation. Commissioned by TBA21–Academy.
Anthropocene traces in the Pacific Ocean: fishing and trans-shipment data near the Nazca-Desventuradas Marine Park off of the coast of Chile.





# TRANSPORT

About 90 percent of global production of goods, components, dry cargo, and solid fuel is shipped across the planet via the oceans.[49] Maritime shipment is the backbone of globalization, which relies on a transport network that facilitates supply chains and international trade. Shipping routes are analogous to terrestrial roads, in that they provide pathways that concentrate vessel movements to connect fixed locations at a minimum distance. They are, in fact, extensions of terrestrial roads and form national and international networks that provide the infrastructure for the trade of goods through maritime services. Over the decades, maritime infrastructures, such as ports and canals, have been enlarged and adapted for larger vessels and expanded traffic. The enlargement of the Suez Canal, completed in 2015, and of the Panama Canal (completed in 2016) increased the optimization of transit for new classes of ships known as ultra large container vessels.[50]

Apart from the Suez and Panama Canals, the world's most frequented shipping lanes are the English Channel, connecting the North Sea and the Atlantic Ocean; and the Strait of Malacca, the shortest route between the Pacific and Indian oceans, through which about 40 percent of world trade, including much of the crude oil destined for China, passes annually, linking major Asian economies such as India, Indonesia, Malaysia, Singapore, China, Japan, Taiwan, and South Korea. As the Strait is vulnerable to disruption, terrorism, and piracy, naval forces from the US, China, and India are all seeking increased influence over its waters.

Other important maritime waterways are the Bosporus in Turkey, which links the Black Sea to the Marmara Sea, ultimately connecting to the Atlantic Ocean and forming a boundary between Europe and Asia; the Strait of Hormuz, which connects the Gulf of Oman with the Persian Gulf; the Danish straits, a system of three channels—the Øresund, the Great Belt, and the Little Belt—that interlink the North Sea and Baltic Sea; and the most important shipping lane in North America, the St. Lawrence Seaway that connects the Atlantic Ocean with the Great Lakes.

China's Belt and Road Initiative, launched in 2013, aims to establish new trading routes by further connecting China, Asia, Europe, and Africa along five integrated pathways. This highly contested, long-term initiative envisages the construction of a trade and transport infrastructure network on land ("Belt") and water ("Road") involving seventy countries and accounting for 60 per cent of the world's population.[51] While reviving the historical imaginary of the peaceful cooperation between cultures and nations embodied in the ancient Silk Road, the Belt and Road project clearly aims at reinstating China as a dominant global power, which would aim at reorganizing and transforming the whole of Eurasia and beyond. Researcher Jegan Vincent de Paul identifies in "the discursive events

49. "Sub-standard ships and poor shipping practices are leading to massive marine pollution and damage", WWF. https://wwf.panda.org/our_work/oceans/problems/shipping/

50. United Nations Conference on Trade and Development, *Review of Maritime Transport 2016* (New York and Geneva: United Nations, 2017): 21.

51. Ibid.

and materials of the Belt and Road [...] the super-narrative of a potential world order."[52] The initiative's maritime transport component focuses on connecting China with Europe, the southern Pacific Ocean through to the Indian Ocean and ending at the Port of Piraeus, in Greece.

The global transport circuit was made possible by the standardized logistic unit of the cargo container. The unified container, invented in the United States in the 1950s at the behest of the US Navy, which was concerned with the supply of its overseas troops, made transport via sea and land cheap, efficient, and seamless.[53] Staging the colorful metal box of the freight container as a central protagonist of late capitalism allowed artist Allan Sekula to contend with the commonly held view that the global era is an age of immaterial and virtual fluxes. The container renders cargo both physical and temporal: "The cargo containers are everywhere, mobile and anonymous: 'coffins of remote labour-power', carrying goods manufactured by invisible workers on the other side of the globe," he noted.[54] By following the slow-paced "social life" of the container, Sekula was able to identify the social and spatial dynamics that are critical to the reproduction of economic integration on a planetary scale. The container is, in his view, a form of storage and transportation unit but also a socio-material force, allowing manufacturing to move to places with low labor costs while forcing the de-skilling of maritime and dock labor. The global supply chain not only (re)creates neocolonial forms of production and resource exploitation, directed north from the Global South but also displaces—in a reversed direction—ecological and human catastrophe to zones of low visibility.

Shipping greatly impacts the marine environment on many accounts: oil pollution, air pollutants, and greenhouse gas emissions; the risk of bio-invasions through ballast water discharges; ship strikes with marine megafauna; and acoustic pollution. The situation is aggravated by the practice of "open registries" (flags of convenience) used by about forty percent (by tonnage) of the world's ships that allow ship owners to avoid stricter labor and environmental regulations.[55] While it is well-documented for some species, there is not enough understanding of the overall impacts of shipping on marine life. Central attention should be placed on critical areas in formerly remote parts of the ocean, such as the Arctic, where the melting of the ice sheet is exposing marine species to new shipping impacts arising from rapidly increasing traffic. shipping through the Northwest and Northeast Passages, as well as the Northern Sea Route should be limited by the development of some form of marine reserves.

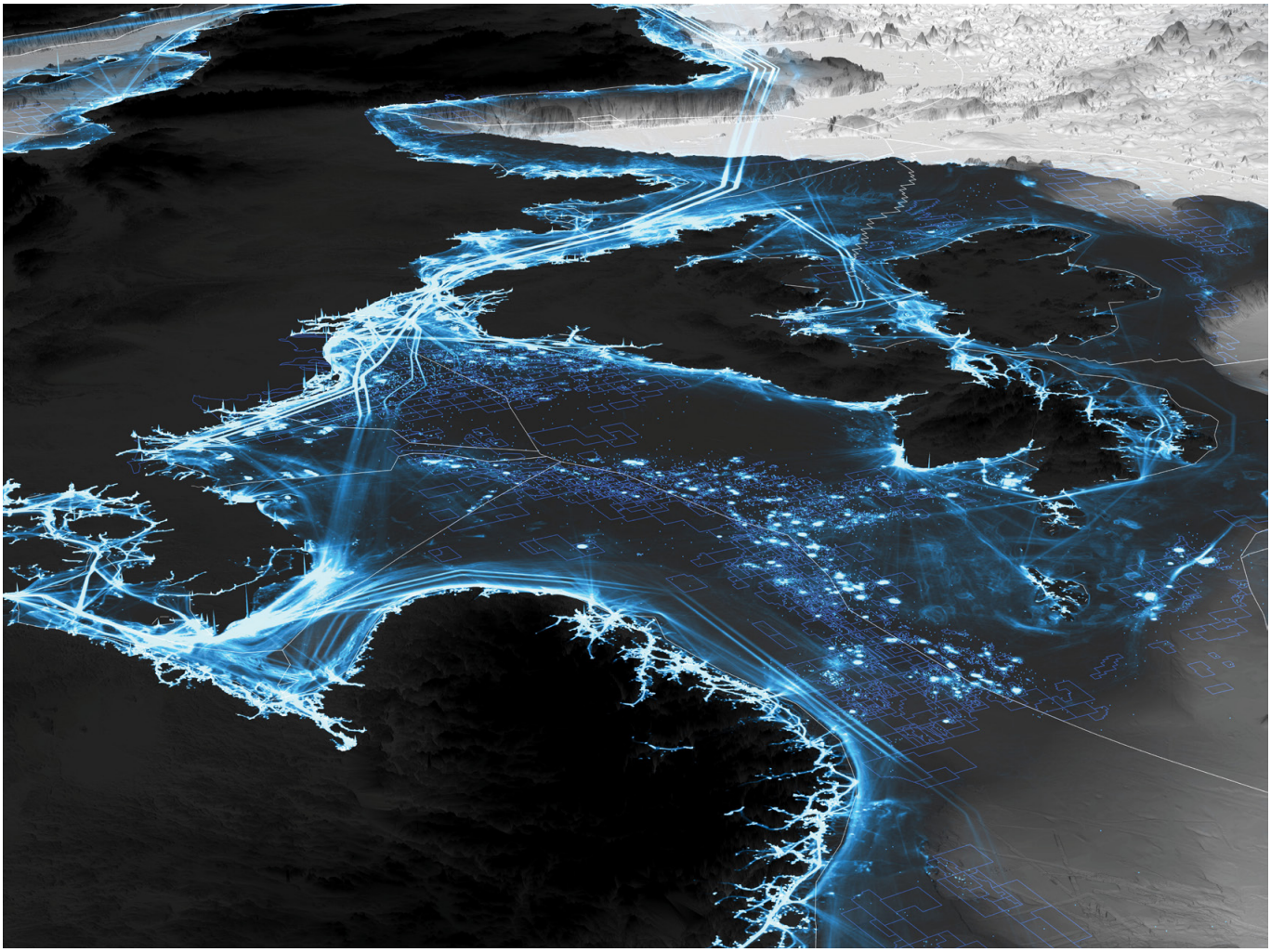
52. Jegan Vincent de Paul, "Transcending History: Considering a Belt and Road Archive," *Allan Sekula: OKEANOS*, eds. Daniela Zyman and Cory Scozzari (Berlin: Sternberg Press, 2017), 261.

53. The port of Cam Ranh Bay in Vietnam was the first military port adapted for container transport, in November 1967. The containerization of military operations was promoted by founder of shipping company Sea-Land Malcom McLean (who invented the shipping container) and adopted under Robert McNamara's effort to rationalize the supply chain. In a profitable move, McLean sent empty containers from Cam Ranh and other Vietnamese ports to Yokohama, Japan, to be loaded with consumer electronics bound for California. The military science of logistics would now make its impact on corporate distribution systems. See http://southwestcorridornorthwestpassage.org/glossary/

54. *Allan Sekula and Noël Burch*, *Notes for a Film*, 19. http://www.theforgottenspace.net/static/notes.html

55. Laleh Khalili, "Carceral Seas," *Allan Sekula: OKEANOS*, 53.

While shipping contributes around 3 percent of global greenhouse gas emissions, it has been excluded from the Paris Agreement's restrictions on emissions (along with aviation). Given that shipping impacts are predicted to rise dramatically as demand for international seaborne trade continues to grow, there is urgent need for the development of effective mitigation strategies.



↑ Territorial Agency: Oceans in Transformation. Commissioned by TBA21–Academy.
The European continental shelves are among the most exploited areas of the global ocean. Aggregate shipping activity and oil licenses. EMODnet data.
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# BATHYMETRY / CONTINENTAL SHELF

Bathymetry is the submarine topography of the "beds" and "floors" of water bodies, including the oceans, rivers, streams, and lakes. Originally, bathymetry was merely concerned with the measurement of the ocean's depth relative to sea level through depth sounding techniques. Today, bathymetric charts are able to reveal variations in sea-floor relief, usually depicted by color and contour lines called depth contours or isobaths, that are measured from a vertical axis that combines geostationary satellites and submersibles. Although less than 20 percent of the ocean's floor has been mapped, bathymetric charts are fundamental for understanding environmental dynamics such as ocean circulation, tides, sediment transport, environmental change, and underwater geo-hazards, along with ensuring navigational security by providing surface and sub-surface information.

The information provided by these "God's eye" views of the oceans' depths, also serve the purpose of administering and exploiting marine resources. Bathymetries are used by coastal states to support the extension of their continental shelf under Article 76 of the United Nations Convention of the Law of the Sea. As laws of sovereignty are based on geological formations, bathymetric charts become primary resources to solve disputes between neighboring states claiming rights over the seabed. These visualizations of the deep sea also play an essential role in facilitating and channeling extractive activities on the ocean's seabed, sometimes referred to as the "new frontier" of resource extraction. Not only does the production of this data create new possibilities to further expand anthropogenic alterations of the Earth System, scarce information also deepens disparities over the access to the so called "blue natural capital."

*Oceans in Transformation* takes most of its bathymetric information from the General Bathymetric Chart of the Oceans (GEBCO), which is supported by the International Hydrographic Organization (IHO) and the Intergovernmental Oceanographic Commission (IOC) (of UNESCO). In February 2018, GEBCO partnered with Nippon Foundation to launch the project "Seabed 2030", which aims to map the totality of the of the World Ocean Floor by 2030, thus creating "the most authoritative publicly-available bathymetry of the world's oceans."

**Continental Shelf**

Geologically, the continental shelf is defined as the submerged prolongation of the landmass, underlain by continental crust, to a point where seabed slope angle markedly steepens and descends to the continental rise or the abyssal plain. The legal definition of the continental shelf considers it to be the natural extension of territory that encompasses the seabed and the subsoil of the shelf, slope, and rise, and excludes the overlying water column. The continental shelf marks the interface zone between oceanic and terrestrial realms and consists of continental margin environments, such as estuarine, salt marsh, mangrove, coral reef, and shelf ecosystems.

This interface is also where humans most directly interact with the oceans. Much of the global economy's goods and services are transported along and across coastal zones; most of the world's fisheries are found within continental margin ecosystems; and much of the waste and materials mobilized from humans and their industrial and agricultural activities are delivered to the coastal zone. About 40 percent of the world's population lives on the coastal plane, increasing human pressures on its ecosystems and exposing mainly urban populations to ocean-related hazards. The carbon cycling in these coastal ecosystems also contributes strongly to balancing the global carbon budget.

The continental shelf, which has so far mainly been explored for oil and gas deposits, is becoming an area of exploitative interest for ore deposits.[56] Almost all types of metal that are in demand today are found in coastal areas: in total more than 1700 ore deposits exist within a distance of less than fifty kilometers from the coast.[57] Geologists from the University of Kiel predict the occurrence of extensive mineral deposits within submerged portions of the continental crust offshore, hidden below the seafloor, as largely undiscovered extensions of the richly endowed belts already mined on land. This includes potential gold deposits off the coast of West Africa, nickel deposits under the Arctic Ocean, and lead and zinc deposits in the Gulf of Mexico and the Mediterranean.[58] Also, near-shore dredging is a significant source of sand for the global construction industry, with tin and iron-rich sands. Seabed mining on the shelf has been banned by several countries because of potential environmental impacts**.** Indeed, some countries have set aside vast tracts of seabed as marine reserves.

As global demand for resources continues to grow for the foreseeable future, declared Exclusive Economic Zones and their contained resources are already intensely contested by neighboring countries. Most prominent contestations are being fought in the South China Sea, in the East China Sea, but also the unilateral revision of Indonesia's map, the Greco-Turkish dispute over the Aegean Sea or disputes in the Arctic Sea region, and are a demonstration of the rising stakes in extraction, national security, and fisheries.

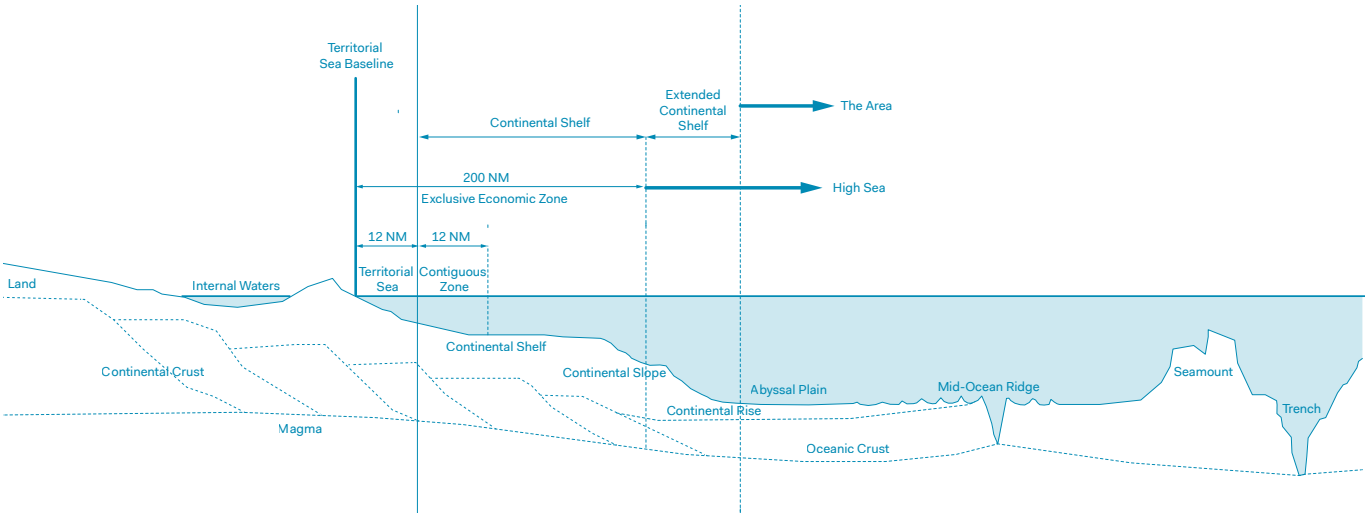
In the context of *Oceans in Transformation*, the continental shelf provides the conceptual framework to analyze the continuity between terrestrial and oceanic activities, reconnecting land and sea in a continuum. Understanding that land and sea are intricately interconnected in a set of gradients of intensity is, in fact, a driving narrative, embedded in the research trajectories of *Oceans in Transformation*. This process of the "territorialization" of the oceans can be attributed to the effects of land reclamation, the "metropolizing" of the oceans and the expansion of logistical networks around shipment and extraction. Spatial relations governed by resource-driven and carbo-capitalist interests do not stop at the borders where land meets the oceans. These relations cannot be identified with

56. According to a UN report on Offshore Hydrocarbon Industries, about 80 percent of offshore extraction takes place on the continental shelf. https://www.un.org/Depts/los/global_reporting/WOA_RPROC/Chapter_21.pdf

57. One example is the 2015 discovery of a giant gold deposit under the Yellow Sea near the largest gold deposits in China. Mark Hannington, Sven Petersen, and Anna Krätschell, "Subsea Mining Moves Closer to Shore," Nature Geoscience vol. 10, no. 3 (March 2017): 159.

58. Ibid.

the study of geography, but rather engage the much broader view of earth science, highlighting the integrated examination of water, atmosphere, climate, ice, soil, and biota and world system analysis. The Anthropocene ocean is indeed a territory partitioned by multiple interests, divided by regulatory instruments, acted upon by human interference and destabilized in its biotic integrity, pushing planetary capacities to their limits. It is a territory—regardless of the paradoxically sounding association to the solid earth—as it is constituted by the same calculative techniques, modes of measuring and controlling, and similar forms of "grabbing" that find expression in land surveying and extraction.




↑ Territorial Agency: Oceans in Transformation.
Commissioned by TBA21–Academy.
Diagram of the principal jurisdictional zones of the oceans.
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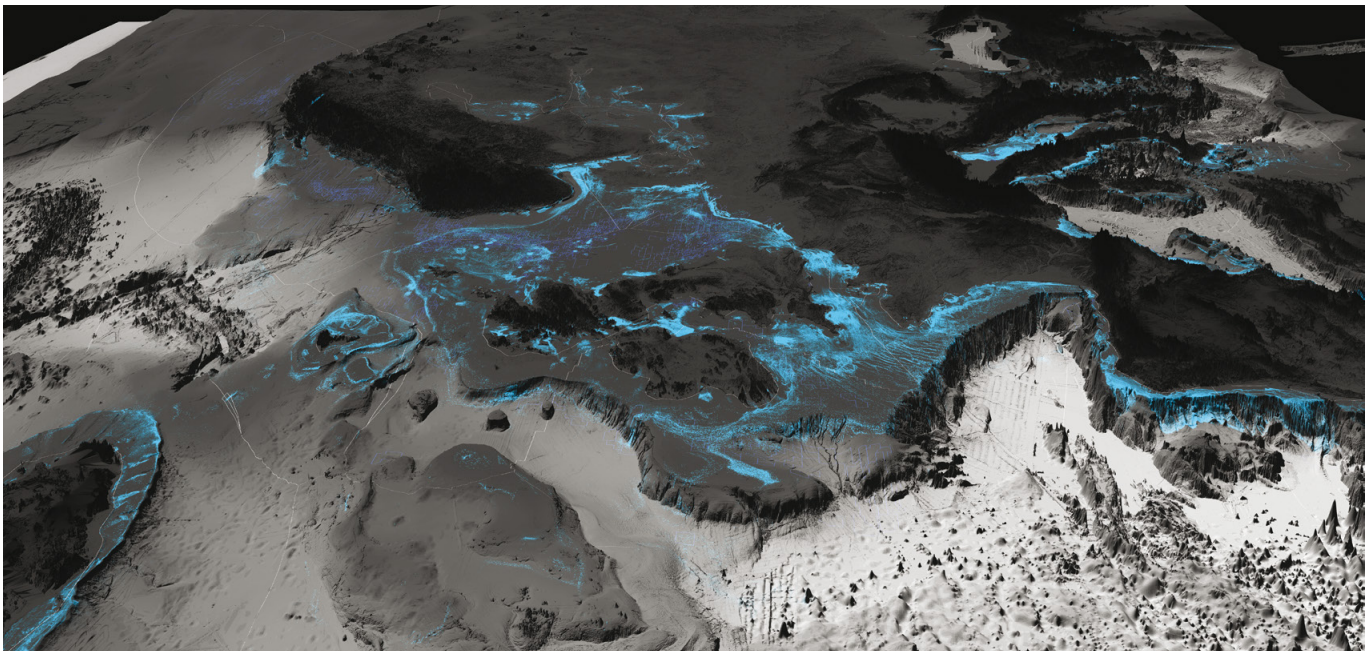

↑ Territorial Agency: Oceans in Transformation.
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The European continental shelf. EMODNET data.
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**Exclusive Economic Zones**

According to Article 56 of the 1982 United Nations Convention on the Law of the Sea (UNCLOS), the EEZ is a sea zone over which "a state has 1) sovereign rights for the purpose of exploring and exploiting, conserving and managing the natural resources, whether living or non-living, of the waters superjacent to the seabed and of the seabed and its subsoil, and with regard to other activities for the economic exploitation and exploration of the zone, such as the production of energy from the water, currents, and winds; 2) Jurisdiction as provided for in international and domestic laws with regard to the establishment and use of artificial islands, installations, and structures, marine scientific research, and the protection and preservation of the marine environment; and; 3) Other rights and duties provided for under international and domestic laws."[59]

The EEZ covers an area of 200 nautical miles (= 370km) from the baselines from which the breadth of the territorial sea is measured. The development of international law since World War II has been closely connected with advances in geological theory and methodologies. The continental shelf has been instrumentalized to justify the spreading of sovereign rights under the sea, especially rights for exploitation of resources. The legal relationship with geology is primarily one of fossil fuel and resource extraction.

Today's international law is based on human experience of the generally stable environmental conditions of the late Holocene. The conditions of the Anthropocene will bring a fundamental shift of the context in which international law operates, a shift in which the challenges are increasingly recognized as the consequences of natural, not only political, change. This may aggravate the existing tensions in the regulation of inter-state relations under international law.[60]

Marine waters beyond the EEZ are referred to as Areas Beyond National Jurisdiction (ABNJ). Nearly two-thirds (64 percent) of the world's ocean is beyond national jurisdiction, a space where no single state has authority. This area reaches depths of over ten kilometers and represents 95 percent of the earth's total habitat by volume. ABNJ are home to significant biodiversity, including unique species that have evolved to survive extreme heat, cold, salinity, pressure, and darkness. Less than 0.1 percent of this immense area has been explored, but there is evidence that ecosystems and species in ABNJ have become seriously degraded because of human activities. The UN Convention on the Law of the Sea creates an obligation to conserve the marine environment, but it does not provide specific mechanisms or processes for conserving marine biodiversity in ABNJ. Other legal instruments address discrete parts of the problem, such as unsustainable fishing or pollution from ships, or apply to specific geographical areas, such as the Southern Ocean.[61]

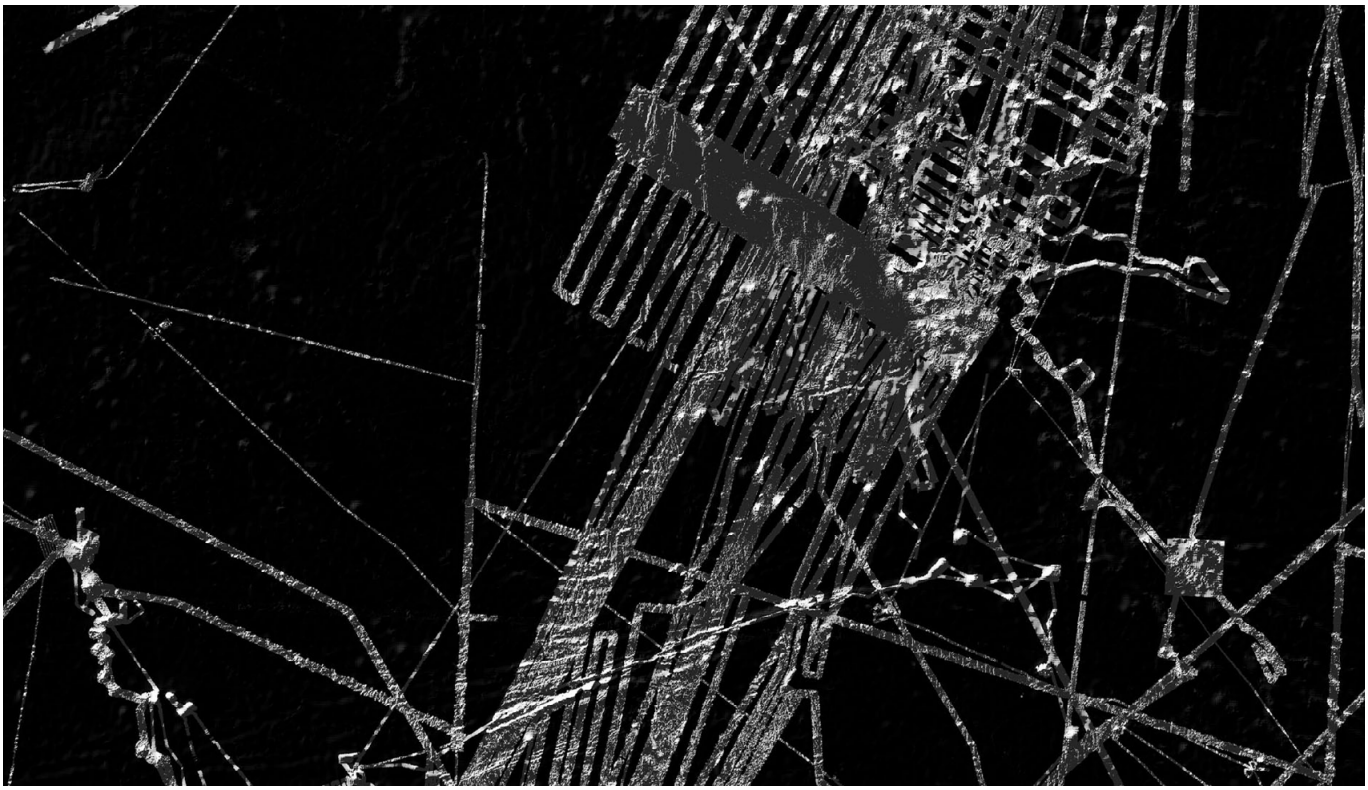
59. United Nations Convention on the Law of the Sea, Part V – Exclusive Economic Zone, Article 56.

60. Davor Vidas, "The Earth in the Anthropocene – and the World in the Holocene?" Esil Reflections, published by the European Society of International Law, 2015.

61. "Governing areas beyond national jurisdiction", IUCN, (March 2019), https://www.iucn.org/resources/issues-briefs/governing-areas-beyond-national-jurisdiction

In recent years, China's actions in the South China Sea have included extensive island-building[62] and base construction activities at sites that it occupies in the Spratly Islands, as well as actions by its maritime forces to assert China's claims against competing assertions by neighbors such as the Philippines and Vietnam. China's activities raise concerns about its intention to gain effective control of the South China Sea, an area of strategic, political, and economic importance.

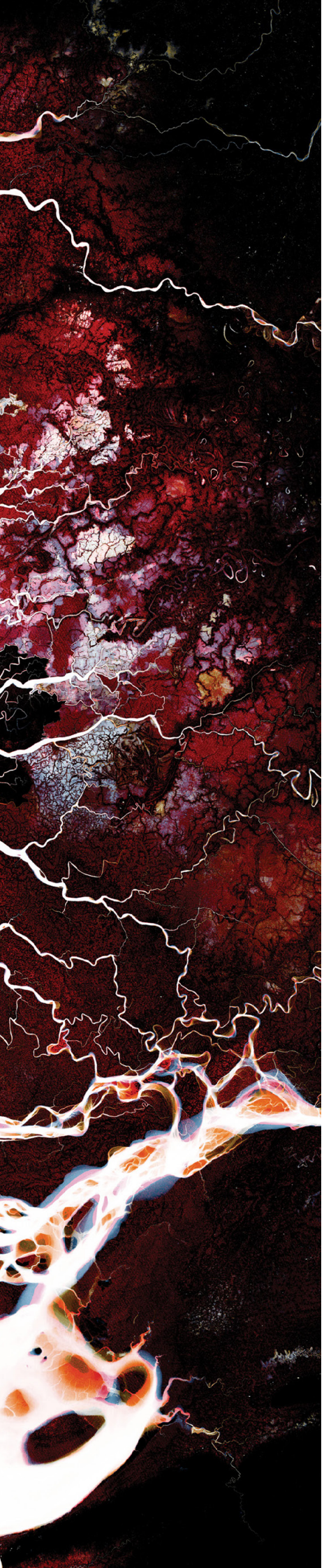
China's interpretation of Law of the Sea and its actions in the South China Sea pose a significant challenge to the principle of the freedom of the seas. Matters of particular concern in this regard include China's so-called "nine-dash line" in the South China Sea, its very narrow definition of freedom of navigation, and the Chinese position that coastal states have the right to regulate the activities of foreign military forces in their EEZs.[63]



↑ Territorial Agency: Oceans in Transformation.
Commissioned by TBA21–Academy.
Pacific Ocean: multi-beam bathymetric soundings
© Territorial Agency

62. According to Article 60 of the UNCLOS, the EEZ gives coastal states "the exclusive right to construct and to authorize and regulate the construction, operation and use of (a) artificial islands; (b) installations and structures for the purposes provided for in article 56 and other economic purposes; (c) installations and structures which may interfere with the exercise of the rights of the coastal State in the zone."

63. Congressional Research Service Report: "U.S.-China Strategic Competition in South and East China Seas: Background and Issues for Congress," see https://fas.org/sgp/crs/row/R42784.pdf





# EXTRACTIVISM / DEEP SEA MINING

The discussion of contemporary extractivism must be premised on a long-term analysis which recognizes that extractivism is, at its very roots, an economic system that was installed and practiced by colonial imperialism since the 1500s. Its main impetus is to convert natural resources such as silver, sugar cane, timber, rubber, and petroleum into globally tradable commodities. In this system, all resources are assigned a market value and managed within a market structure. Colonialism and its afterlives extend to the present day, and are aggravated by neoliberal privatization and deregulation processes. Indigenous territories are still often regarded as terra nullius (nobody's land), based on the doctrine of discovery. The history of extractivism, or extractive capitalism, is motivated by racial capitalism.

In the twenty-first century, extractivism targets resources, on land and water, often under the stewardship of indigenous populations and Global South nations. It engages in the forced removal of people, the violent reorganization of their lives, and the extraction of natural or genetic resources. As Macarena Gómez-Barris argues in *The Extractive Zone*, a critical analysis of extractive capitalism in the Americas, native and indigenous peoples are yet again being racialized, branded, and "constructed by the state and corporate entities as obstructions to the expansion of extractive capitalism."[64] Indigenous land defense—for instance against the construction of the Dakota Access Pipeline in the United States or local communities in Papua New Guinea have been mobilizing forces against seabed mining in the national waters—are described and classified as offenses against the rule of the state. Furthermore, the struggle over land (and water) rights has caused an unprecedented rate of killings of activists attempting to defend land and resource in the past years, especially in Brazil, the Philippines, and the Asian Pacific, where social movements have been forming against organized grabbing.[65]

The research conducted in recent years, identifying the drivers and systems of extractivism, must be extended to include the world oceans in order to describe the increasing ontological and spatial complexity of economic globalization and the devaluing of human social organizations and ecologies. This analysis should also pay close attention to the fact that climate change can be usurped as an argument to justify the involuntary and violent expulsion of peoples living in close proximity to the oceans and who often consider themselves the guardians of the ocean's wellbeing.[66]

The deep sea presently being prospected is the last frontier of extractivism. Remotely-operated vehicles (ROVs) and drilling units have drawn the seabed within the reach of a new class of explorers, investors,

64. Macarena Gómez-Barris, *The Extractive Zone: Social Ecologies and Decolonial Perspectives*, Dissident Acts (Durham, NC: Duke University Press, 2017), xvii.

65. Global Witness 2014 report: *Deadly Environment: The Dramatic Rise in Killings of Environmental and Land Defenders*.

66. Saskia Sassen, *Expulsions: Brutality and Complexity in the Global Economy* (Cambridge, MA: The Belknap Press of Harvard University Press, 2014).

and international private-public partnerships. About 1500 ultra-deepwater semi-submersible Mobile Offshore Drilling Units (MODUs), designed to drill subsea wells for oil exploration and production, such as the ill-fated Deepwater Horizon are currently being deployed all over the globe for deep-water exploration.

**Deep Sea Mining**

Providing about a third of current fossil fuel production, extreme oil and gas extraction is the precursor to a novel entrepreneurial exploit: deep sea mining.[67] The rush to the deep and into new techno-geographies of extraction, regardless of ecological and political implications and the costly occurrences of spilling disasters or carbon cycle disturbance, is being promoted and field-tested as the coming mega-industrial feat in the conquest of nature. The first exploration licenses for manganese nodules in the central Pacific Ocean were issued in 2001 by the International Seabed Authority, the UN body regulating seabed exploitation. Boundless reserves of manganese and polymetallic nodules located at depths below 4,000 meters, cobalt-rich ferromanganese crusts of coral-rich seamounts, and sulfides formed by hot vents (so-called black smokers) near tectonic plate boundaries, but also gold, copper, and rare-earth findings have fueled commercial euphoria over marine mining and are now examined for future production. Many of the difficulties of working in the submarine environment have been overcome by the oil and gas industry, and the skills and expertise from that sector are readily transferrable to seabed mining.

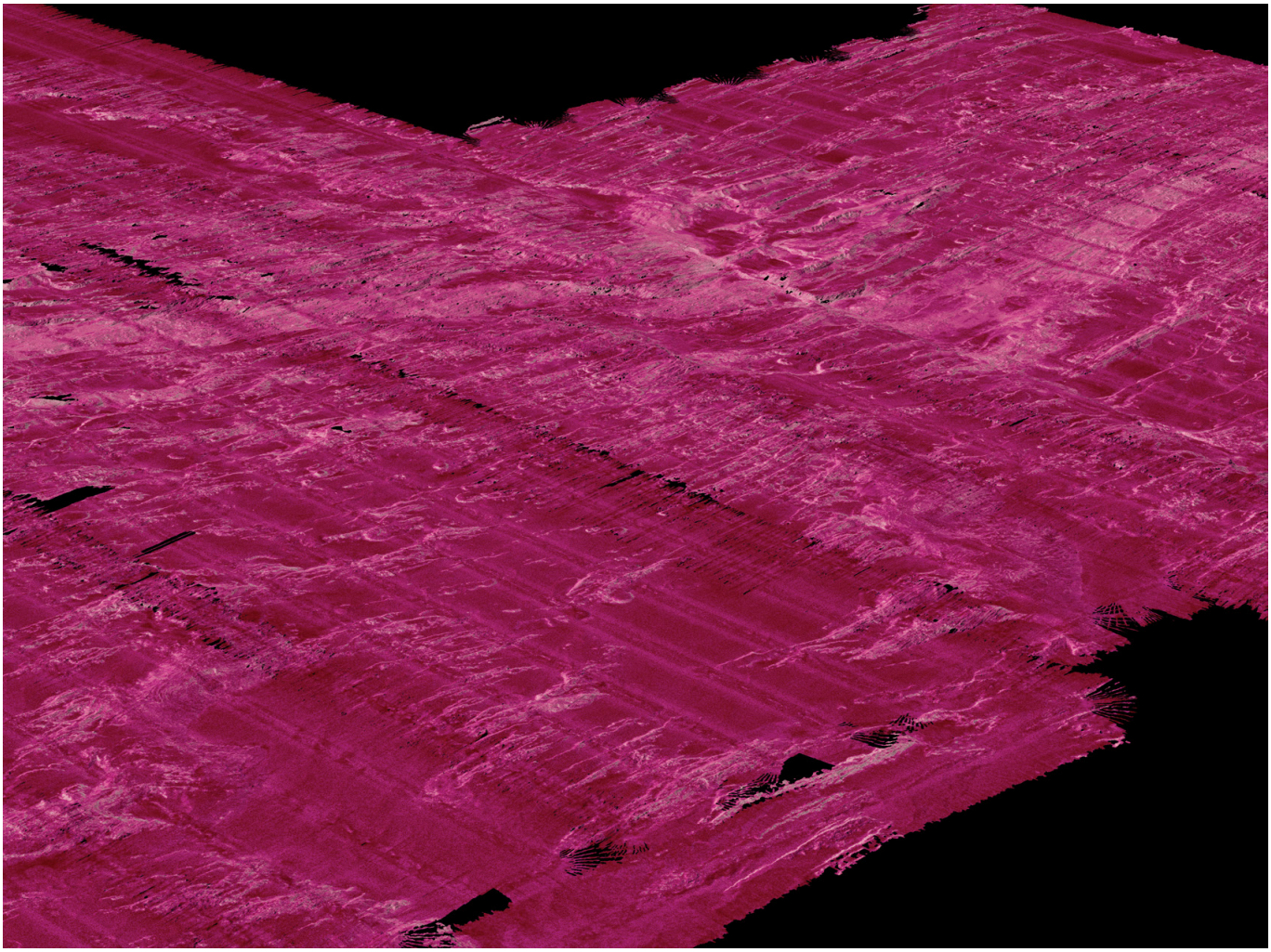
The interest in extreme, deep-sea metal is mandated by the sharp increase in resource prices and the rising demand on world markets, especially for batteries used in renewable energy systems. Industrial and geo-political interests in safeguarding national supplies have deterritorialized mineral extractionism through international partnerships in Pacific Island nations, such as Papua New Guinea, Fiji, Nauru, and Tonga, but also New Zealand, Japan, and the Portuguese Azores archipelago. Countries with no access to sea resources are seeking to assert extraterritorial claims in the oceans and are lobbying with international policy entities. The speculative prospects of deep-sea mining are re-drawing the colonial frontier.

The greatest mining interests currently converge on the sediment surface across abyssal plains in the Clarion-Clipperton Zone (CCZ), a region spanning 4.5 million square kilometers across the central Pacific Ocean around 4,000–5,500 meters deep. This is the area of the seabed beyond national jurisdiction where the International Seabed Authority has awarded sixteen contracts to sponsoring nations for exploration and potential exploitation.

The industrial-scale prospecting in the oceans comes at a time of increased awareness of the fragile aquatic ecosystems supporting planetary survival through their regulatory functions. Hydrofeminist thinkers, ecologists, marine biologists, and artists have contributed to other forms of engaging with the oceans. They have raised strong concerns against the

67. Marc Margolis, 'The Age of Extreme Offshore Oil Is Just Beginning | Discover Magazine', 18 2011, https://www.discovermagazine.com/environment/the-age-of-extreme-offshore-oil-is-just-beginning.

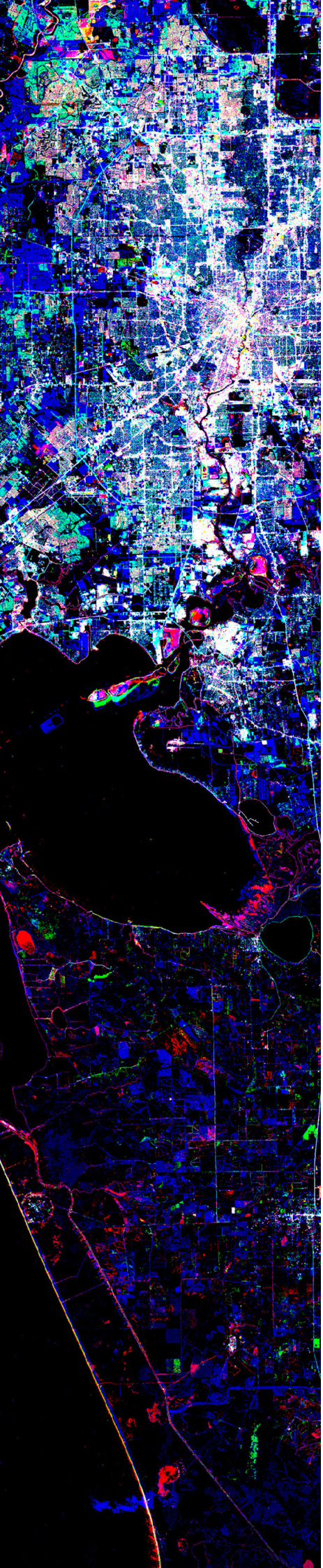
prevalent process of bringing "nature" into the neoliberal system, whereby the commodification of natural resources is being construed as a project of blue sustainability, combining the interests of capital with ecological ambitions. By "selling nature to save it," "nature" is being offered "the opportunity to earn its own right to survive in a world market economy."[68] The rampant exploitation of the deep occurs along with the exploitation of other nonhuman life-forms, innocuous organisms whose majority we have not even begun to know. Newly discovered microbial symbionts are being retrieved from the "last unexplored wilderness"[69] of the deep sea and then patented by pharmaceutical companies appropriating biological diversity in the name of science and conservation.



↑ Territorial Agency: Oceans in Transformation. Commissioned by TBA21–Academy. Multibeam sonar sounding of Reykjanes Ridge in the Atlantic Ocean. © Territorial Agency

68. Kathleen McAfee, "Selling Nature to Save It? Biodiversity and Green Developmentalism," *Environment and Planning D: Society and Space* vol. 17, no. 2 (April 1, 1999): 134.

69. Inhabitants, What Is Deep Sea Mining? Episode 2: Deep Frontiers, with Stefan Helmreich, 2018. See https://vimeo.com/channels/inhabitants/280160100.





# COASTAL URBANIZATION / COASTAL ECOSYSTEMS

The *Oceans in Transformation* trajectories reveal that most major cities are located by the sea and many in low-lying coastal zones. Coastal zones have experienced massive urban expansion in recent decades and are most prone to climate-related urban vulnerability. Asia's unprecedented growth, with its urban population expected to reach 2.4 billion in 2030 is heavily at risk,[70] with China, India, Bangladesh, Indonesia, and Vietnam currently at most risk of severe marine dangers. However, Africa is expected to experience the highest rates of population growth and migration to mega-delta cities in the coastal zone, particularly in Egypt and Sub-Saharan countries in Western and Eastern Africa.[71] These countries are also characterized by very large extents of non-urban settlements in the low-lying coast areas.

The convergence of urbanization and climate escalation has led to the formation of what scholar Ashley Dawson has termed "the prototypical social form of our age: the extreme city,"[72] modelled after non-adaptive Eurocentric urbanist visions. The extreme city is an urban space marked by economic inequality and great unsustainability, pressured by water shortages, air pollution, heat waves, traffic chokes, sea level rise, ecological degradation, and many other anthropogenic stressors. While some cities are better equipped and financially in the fortuitous position to possibly adopt preventive and mitigating measures, the top ten candidates are evenly distributed between developed and developing countries.[73] Indeed, as Dawson argues, "how a city copes with stratifications of race, class, and gender [...] has everything to do with how well it will weather the storms that are bearing down on humanity."[74] Indeed the extreme city—not only in the Global South—is where struggles will begin, especially in the rapidly urbanized coastal zones.

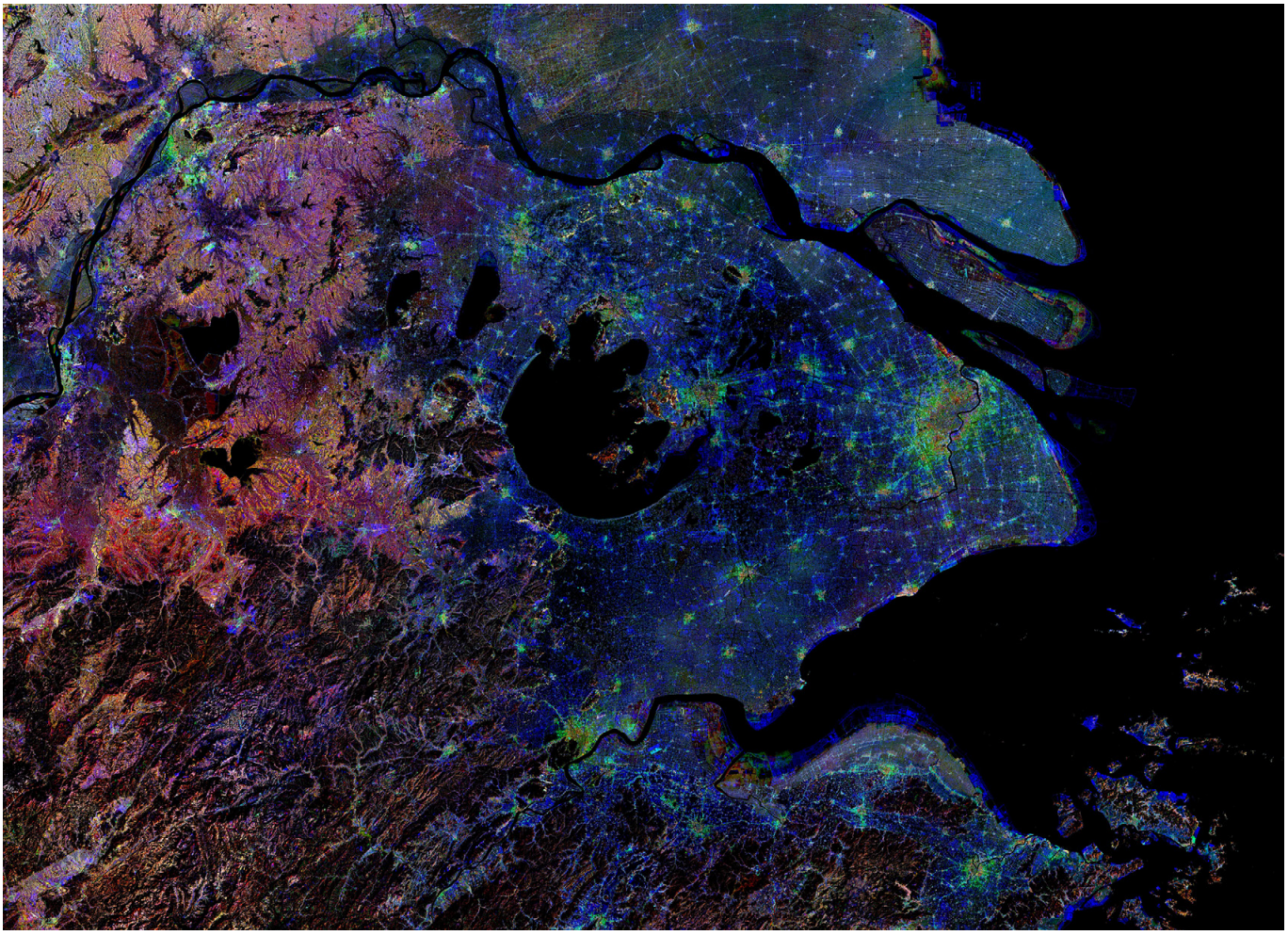
70. Roland Fuchs, Mary Conran, and Elizabeth Louis, "Climate Change and Asia's Coastal Urban Cities: Can They Meet the Challenge?" Environment and Urbanization ASIA vol. 2, no. 1 (March 2011): 15. The IPCC's 5th Assessment Report predicts that environmental factors will have severe and pervasive effects on the lives of the 1.6 billion people who live on the Indian subcontinent, slowing economic growth, affecting food security, and impacting health and development (IPCC 2014).

71. Barbara Neumann et al., "Future Coastal Population Growth and Exposure to Sea-Level Rise and Coastal Flooding - A Global Assessment," *PLOS ONE* vol. 10, no. 3 (11 March 2015): 1, https://doi.org/10.1371/journal.pone.0118571.

72. Ashley Dawson, *Extreme Cities: The Peril and Promise of Urban Life in the Age of Climate Change* (London and New York: Verso, 2017), introduction.

73. They are according to Dawson Mumbai, Guangzhou, Shanghai, Miami, Ho Chi Minh City, Kolkata, Greater New York, Osaka-Kobe, Alexandria, and New Orleans.

74. Ashley Dawson, Introduction to *Extreme Cities: The Peril and Promise of Urban Life in the Age of Climate Change*. (London: Verso, 2019).



↑ Territorial Agency: Oceans in Transformation. Commissioned by TBA21–Academy. Shanghai, China: multi-year transformation of metropolitan areas and future sea level rise. © Territorial Agency

Key factors for climate-related urban vulnerability are:

Elevation: Most coastal cities are at sea level, making them vulnerable to flooding caused by increases in sea level, extreme weather, and tsunamis. Typhoons, storm surge, and cyclones create catastrophic convergences, often with a high death toll.

Topography: Many coastal cities (but certainly not all) are surrounded by mountains and other topographic features that can generate extreme precipitation. Many more lie on estuaries, sinking delta soils, or other low-lying topography exposed to river, as well as coastal, flooding.

Land use: Many coastal cities are hubs of intensive industrial activity, including oil refining, ports, and airports, generating exposure for people and infrastructure that may be critical for economic and business continuity. These cities are vulnerable to flood impacts as floodwaters cannot be absorbed by paved roads and built infrastructure. Urbanized landscapes also contribute to the high temperature of coastal cities relative to the less settled areas that surround them.

Population density: High population density, especially in low-income and, at times, informal settlements, generates concentrated human exposure and challenges the capacity of transport systems in case of evacuation, and of disaster response and reconstruction capacity.

Heat: South Asia, the Persian Gulf states, and states in Southeast Asia, are epicenters of heat waves. Their urban centers are, literally, at the core of this problem: the region's cities are enormous, their populations grow exponentially and live in densely-built, often poorly constructed neighborhoods, and their physical infrastructures combine urban sprawl with intense vertical growth. The resulting urban heat islands raise temperatures even more, breaking records and making some areas unfit for human nonhuman habitation.

Other non-climate related factors: The over-extraction of groundwater, pollution, and over-concentration of skyscrapers, causing land subsidence through compaction of soils and withdrawal of groundwater. (The Pearl and Mekong River Deltas are already below sea level. Cumulative subsidence is on the order of three meters in the Yangtze Delta, Shanghai, and Tianjin City [Xu]. Bangkok and north Jakarta are sinking at up to four and six centimeters respectively per year.)[75]

The rapid urbanization of coastal cities—especially megacities of 10 million people or more—is extremely taxing on marine ecosystems. The main factors are: accelerated subsidence (the caving in or sinking of land) in coastal delta cities caused by excessive building; the significant extraction of groundwater and the ensuing pollution of soil and groundwater reserves; resource extraction; pollution and the disturbance of habitat, causing significant changes in the populations and resilience of species; the heightened vulnerability of coral reefs, coastal wetlands, tropical mangroves, and other ecosystems; and diminished water quality in oceans and estuaries.[76]

Intersectional factor: As scholars have shown, the effect of climate exigencies intersects with a variety of social conditions, such as wealth, gender, ethnicity, and governance policies. These reinforce overlapping and interdependent systems of discrimination or disadvantage. Many coastal cities, particularly those in the developing world, have areas of significant poverty, with society's most vulnerable people being the least able to find protection against floods and storms.[77]

**Coastal Ecosystems**

Vegetated coastal ecosystems protect the coastline from storms and erosion and help buffer the impacts of sea level rise. They are dependent on the abundance of a small number of dominant species of mangroves, saltmarshes, seagrasses, kelp forests, and reef corals that stabilize sediments

75. Roland Fuchs, Mary Conran, Elizabeth Louis. Climate Change and Asia's Coastal Urban Cities: Can they Meet the Challenge? Environment and Urbanization ASIA, (June 2011): 13–28. https://doi.org/10.1177/097542531000200103

76. Secretariat of the International Human Dimensions Programme on Global Environmental Change (UNU-IHDP) 2015 report: "Coastal Zones and Urbanization."

77. Anna Kaijser and Annica Kronsell, "Climate Change through the Lens of Intersectionality," *Environmental Politics* vol. 23, no. 3 (Oct 2013): 417–33.

and provide critical shoreline protection from storms. These areas are also important nursery habitats for fisheries.[78] Nearly 50 percent of coastal wetlands have been lost over the last 100 years as a result of the combined effects of localized human pressures, sea level rise, warming and extreme climate events (50% percent of mangroves lost, 30 percent of seagrasses). There has also been significant loss of so-called dry land, converted from open water, along the Atlantic Coast for instance.

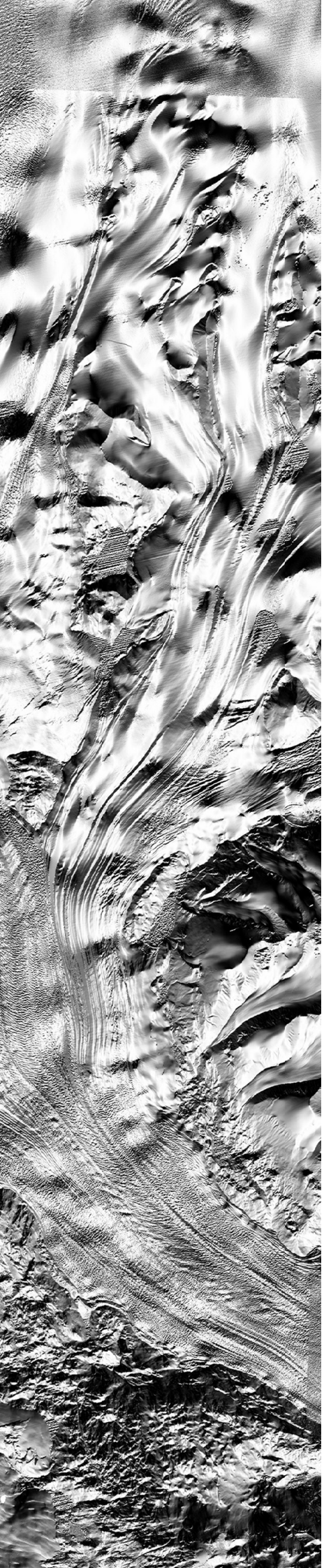
Vegetated coastal ecosystems are important carbon stores; their loss is responsible for the current release of high levels of $CO_2$ into the atmosphere. The impacts of sea level rise on coastal ecosystems include habitat contraction, geographical shift of associated species, and loss of biodiversity and ecosystem functionality. Impacts are exacerbated by direct human disturbances, and where anthropogenic barriers prevent landward shift of marshes and mangroves (termed "coastal squeeze").[79]

"Managed retreat" or "managed realignment" is a coastal management strategy that allows the shoreline to move inland. Natural coastal habitat is enhanced seaward of a new line of defense. I*ntertidal habitats and natural coastlines provide an important buffering function for flood protection.* This approach is relatively new but is gaining traction among coastal policymakers in the face of increased coastal hazard risks. There is a growing recognition that attempting to "hold the line" in many places is a losing battle.[80]

78. Jeremy B. C. Jackson, "Revaluing the oceans", *Oceans in Transformation*, eds. Territorial Agency and Daniela Zyman (forthcoming, 2020).

79. SROCC, 2019

80. Sean Cornell, et. al. "Coastal Processes, Hazards, and Society", InTeGrate. https://www.e-education.psu.edu/earth107/node/701





# CLIMATE JUSTICE: INDIGENOUS KNOWLEDGES OF LAND AND WATER

The oceans have long represented sites for extracting, exchanging, and exploiting labor and resources. They act as archives for the histories of capitalist expansion through power, science, navigation, and enclosure, producing forms of licit and illicit trade formed along lines of prevailing winds and oceanic currents. Silently complicit in the enactment of the slave trade, the ocean's waters have paid witness to the cruelties and immiseration wrought by the manifold forms of violence of imperial capitalism.

The human condition of living in radically changing times has made the call to becoming more sensible and sensitive to the oceans more urgent than ever. Indigenous communities who live in accordance with the pronounced seasonal cycles on land and water are experiencing a great *metamorphosis* and a profound disorientation about the relationship with other life forms. The seven trajectories of *Oceans in Transformation* traverse areas whose communities have been put under extreme pressure by the Anthropocene and by global economic drivers causing or aggravating anthropogenic transformations.

These critical accounts illustrate that as geographically dispersed as these areas may be, from the wetlands of Ogoniland in the Niger Delta region to the headwaters of the Amazon, from the warm Caribbean Sea to the Russian Arctic coast, from the reserves of the Andes to the Pacific islands, frontline inhabitants are being systematically displaced, if not slayed, by the effects of exploitation. The geographical orientation of these itineraries is best informed by a *longue durée* analysis which recognizes that most of these dynamics of dispossession and exploitation are, at their very roots, economic projects of colonial imperialism dating back to the 1500s. While defending their rights to the land, indigenous communities are also being recast as obstructions to resource exploitation and forcefully removed or resettled from their ancestral territories.

Addressing climate justice adequately implies a closer examination of who counts as the "anthopos" in the new age and to break with the idea that the ecological crisis affects everyone equally. It is by now a well-known fact that those who have contributed the least to the emission of $CO_2$ and to the ruthless extraction and capture of the world's resources are those who are already experiencing much of the toll of the climate emergency and will increasingly do so in the future. There is also vast literature describing how racial hierarchies, long supported by reductionist scientific classification, colonial mapping, and the intricacies of the law have produced "a hemispheric colonial project split[ting] humans into categories differentiated from each other and from nonhuman life."[81]

81. Macarena Gómez-Barris, *The Extractive Zone: Social Ecologies and Decolonial Perspectives*, (Durham: Duke University Press, 2017), 140.

Thus, climate justice means to build solidarity across polities and to redistribute responsibilities to those who have to pay the price of their transgressions and the excessive use of the world's resources. There is no justice without also targeting Black, brown, rural, and indigenous rights violations by industrial extractivism, or the displacement of people caused by spills, mining disasters, or the pollution of land and water. The grabbing of resources, amplified by the metrics of inviolable growth, is provoking ever stronger protests claiming the importance of local resource sovereignty and scrupulous attention lent to indigenous communities' ways of knowing and living in the world. These forms of living and cohabitation with the world's others, its animals, natural agencies, and ecological ensembles serve as inspirations and stimulus to conceive of alternative ways of becoming that which do not divide nature from culture, land, and property. Paying greater attention to ancestral and autochthonous social ecologies encourages us to identify and recover practices and processes that seek to support the survival and safeguarding of the planet as a living entity and recultivate the biosphere's capacities for renewal.

**Deforestation**

The major regions affected by deforestation are the Amazon, Cerrado, the Atlantic Forest/Gran Chaco, Borneo, Choco-Darien, Congo Basin, Eastern African, Eastern Australia, the Greater Mekong, New Guinea, Sumatra, and the Russian boreal forests.

Two major datasets disagree on the annual loss of tree cover loss: in 2017, a Global Forest Watch report produced by the University of Maryland, described a decline of 29 million hectares whilst the Global Forest Resources Assessment (FRA) reported a loss of 3.3 million hectares, stating that deforestation rates have been declining by 50 percent over the past decade. The satellite-based Global Forest Watch is, however, more rigorous. It asks a simple question of the Landsat images it analyzes: What area of tree cover has disappeared since last year? It does not ask how or why, just how much. The FRA data, on the other hand, is largely a measure of registered land use rather than actual tree cover. For instance, its definition of a forest includes areas that may be treeless as a result of logging, but where governments still classify the land as productive forest that is expected to regrow and be logged again.[82] Territorial Agency has been using data coming from the Maryland University's Global Forest Watch and the WWF to analyze forest lost.

The main causes of deforestation around the world are:

The conversion of forests for other land uses: including pulp, palm, and soy plantations, pastures, settlements, roads, and infrastructure.

Forest fires: Each year, fires burn millions of hectares of forest worldwide, and degraded forests are particularly vulnerable. These include heavily-logged rainforests, boreal forests, forests on peat soils, or where forest

82. Fred Pearce, "Conflicting Data: How Fast Is the World Losing its Forests?", YaleEnvironment 360. October, 2018. https://e360.yale.edu/features/conflicting-data-how-fast-is-the-worlds-losing-its-forests

fires have been suppressed for years, allowing unnatural accumulation of vegetation that makes future fires burn more intensely. The resulting loss has wide-reaching consequences on biodiversity, climate, and local economies.

Illegal and unsustainable logging: Illegal logging occurs in all types of forests across all continents, from Brazil to Indonesia, destroying nature and wildlife, taking away community livelihoods, and distorting trade. Illegally harvested wood finds its way into major consumption markets, such as the US and the European Union, which further fuels the cycle.

Fuel wood harvesting: Over-harvesting for domestic use or for commercial trade in charcoal significantly damages forests.

Mining: The impact of mining on tropical forests is growing due to rising demand and high mineral prices. Mining projects are often accompanied by major infrastructure construction, such as roads, railway lines, and power stations, also putting pressure on forests and freshwater ecosystems.

Climate impact: Forest loss is both a cause and an effect of changing climate. Climate change can damage forests, for instance, by drying out tropical rainforests and increasing fire damage in boreal forests. Inside forests, climate change is already and increasingly harming biodiversity.

According to NASA's Land Cover and Land Use Change program, the boreal forest, forming a ring around the Arctic Circle, comprises up to 32 percent of the world's forested area, making it one of the largest biomes on earth. Furthermore, it is as important as the tropical rainforest ecosystem in terms of global climate dynamics. Boreal forests in Russia account for over 25 percent of the world's total forested area (and hold almost 50 percent of the northern hemisphere's terrestrial carbon) and about one-third of the world's boreal forest is in North America. For many indigenous people, these forests are the most important resource; forest products (timber harvesting and non-timber forest product collection) and other wild natural resources like tundra, marine, and freshwater serve as the major subsistence sources for almost all Northern Hemisphere indigenous nations.[83]

Boreal forests have been burning at an unprecedented rate during the past few decades, due to increased temperatures and drier conditions in the Arctic region, which is driving massive changes in the taiga. Greenpeace analysis of satellite data reveals that 3.5 million hectares have burned in 2016 in Russia alone.[84] These wildfires are contributing to the so-called black carbon, more commonly known as plain old soot, generated mostly from the burning of diesel fuel, coal, and woody plant material, which are

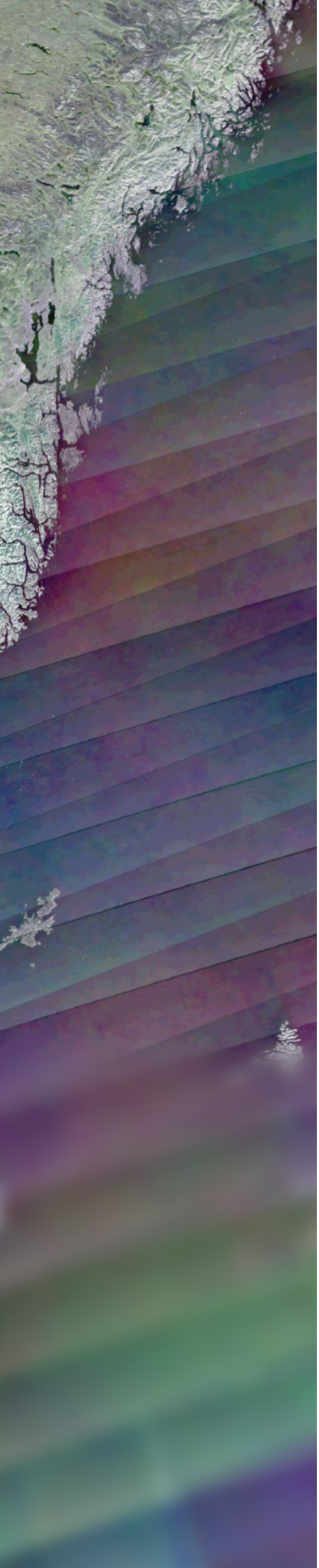
83. See "Boreal deforestation of Far Eastern Siberia" on LCLUC's website: https://lcluc.umd.edu/hotspot/boreal-deforestation-far-eastern-siberia and the World Wildlife Fund (WWF) 2007 report: "Russia's Boreal Forests."

84. Alec Luhn and Damian Carrington, "Russia significantly under-reporting wildfires, figures show," the Guardian (June 16, 2016), https://www.theguardian.com/world/2016/jun/16/russia-significantly-under-reporting-wildfires-figures-show

the second-most important heat-trapping pollutant.[85] Australia's exceptionally violent bush fires of 2019–20 extinguished more forest area than forest loss occurring worldwide in a single year (10 million hectares). More recently, scientists have been urging for a different approach toward regaining a more sustainable coexistence with landscape fire, as fire suppression practices in most regions are deemed to come at the cost of an increased risk of more severe or extensive future fires.[86]

85. Michael D. Lemonick, "Black Carbon Second Only to $CO_2$ in Heating the Planet," https://www.climatecentral.org/news/black-carbon-second-only-to-co2-in-heating-the-planet-new-study-15465.

86. Stefan H. Doerr and Cristina Santín, "Global Trends in Wildfire and Its Impacts: Perceptions versus Realities in a Changing World," Philosophical Transactions of the Royal Society B: Biological Sciences vol. 371, no. 1696 (June 2016), https://doi.org/10.1098/rstb.2015.0345.



# TRAJECTORIES

1 North Sea to Red Sea
2 The Gulf Stream
3 Equatorial Pacific
4 Mid-Atlantic
5 Indian Ocean Gyre
6 Metropolitan Asia
7 Humboldt Current

# TRAJECTORIES

"Whatever the material 'nature' of the ocean is today, it is multiple—high-tech, low-tech, sublime, dirty, lively, deadly—not simply an ahuman force with which one might, as human maker, negotiate." —Stefan Helmreich and Caroline Jones

Trajectories are geographical, conceptual, and research itineraries using compilations of global open-access data sets that trace and measure the transformations of the earth system. The data sets aggregate information and shed light on cultural, political, historical, and human to nonhuman relations. According to Territorial Agency, the trajectories are "alternative ways of storying and mapping waters [that] can give voice to inclusive and evolving vocabularies of water places, thereby transforming collective ways of thinking." By interconnecting research resources, the dynamic images of *Oceans in Transformation* create unexpected resonances between disciplines and paradigms that rarely communicate. Different explorative narratives unravel the multiple histories written into the oceans. They have been compiled to assess the magnitude and incommensurability of the transformations wrought by the manifold forms of violence and intrusion directed against the world's oceans.

The multiple agencies acting upon the planet as nature-cultural forces are registered in this study as the enmeshed conditions causing the intolerable degradation of the oceans. Pivoting between world and earth science and resting on knowledge produced by philosophy, the humanities, indigenous thinking, and the arts, *Oceans in Transformation* is, according to curator Anselm Franke, "a border operation that works at the edge of disciplinary languages, of readability, of protocols and knowledges. It has its place in the in-between of languages, at the fringe of the linguistic conventions and disciplinary universes, where lived practice and expert discourse expose their inevitable gaps."[87]

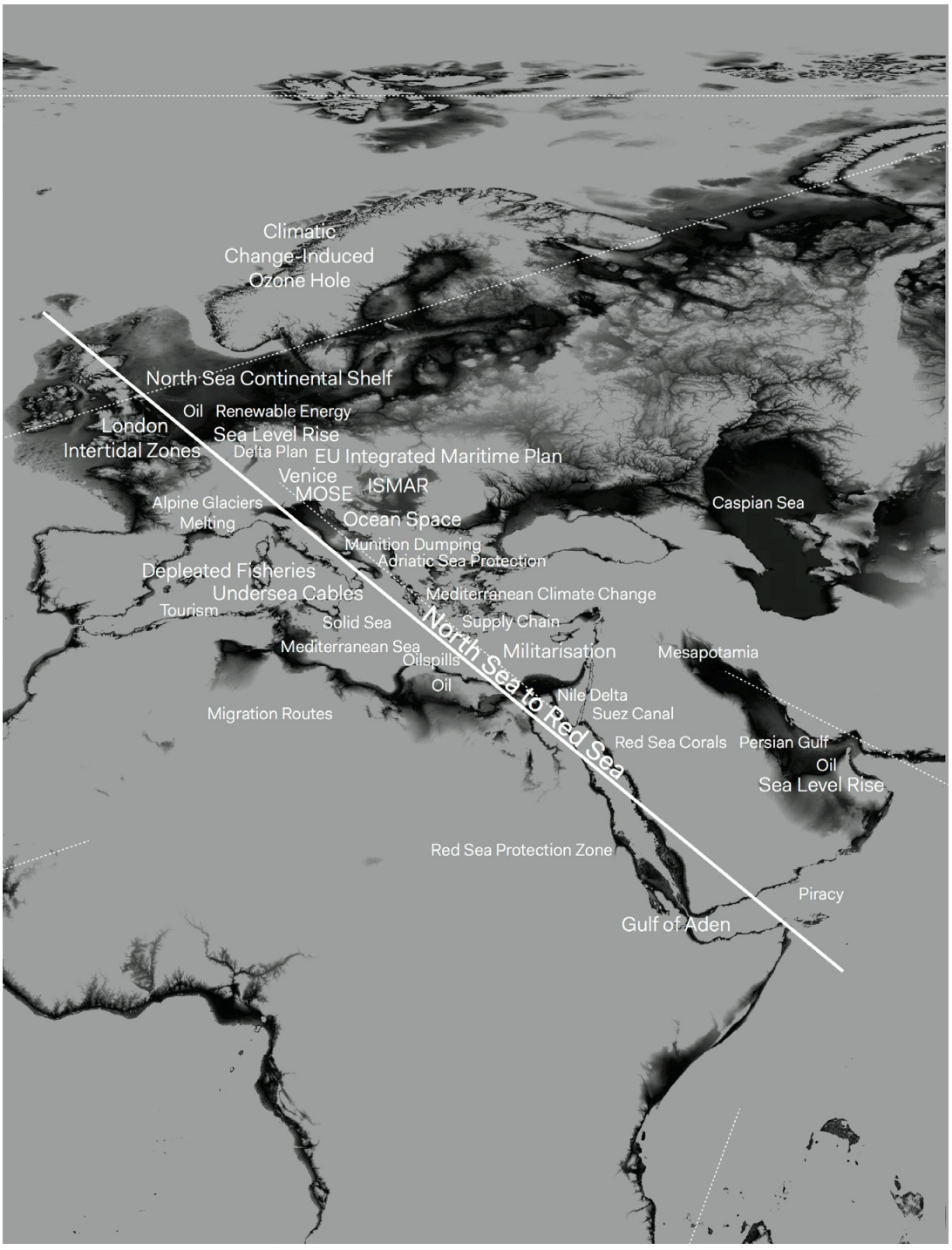
87. Anselm Franke, "Oceans in Transformation, Or: The Frontiers of Ambiguity on the Other Side of Artistic Indeterminacy," *The Commission Book*, ed. Daniela Zyman and Eva Ebersberger (Berlin: Sternberg Press, 2020), 887.

The entries unfolding each trajectory, written to theorize and unravel the forces and agencies acting on sea and land and between different perspectives, are not meant to describe new marine regions. They also resist the reductive reading of the oceans as a space of connection, set in motion by human activities, the flow of commodities, and capital. Instead, these unfoldings attempt to narrate the material, political, and inter-semiotic relations along and across the sensible zone. They give a voice to aquatic, geological, climatic, material, human, organic, and conceptual agencies that have emerged from the reciprocal evolution of organisms and their changing environments, the histories of human activities, and the residues and obsolete mattering of what nearly eight billion humans seek to cast away.

The texts wrestle with the (im)possibilities of describing and giving shape to these hyphenated hydro-political-economic deep-scapes and the networks that sustain them. The stories that bind these assemblages together will always remain incomplete, partial, and temporary. As is implicit to any creative-intellectual project of reimagination, they evolved from multiple conversations and inquiries across texts and disciplines, knitting together points of views, policy statements, and a variety of intellectual narratives, honoring as faithfully as possible their respective sources and origins.

Unless otherwise noted, texts by Pietro Scammacca and Daniela Zyman

# 1. NORTH SEA TO RED SEA




**Geographical Areas covered**

**Peatlands of Scotland; North Sea Continental Shelf and the Netherlands; Alpine Glaciers, Po Valley, Venice and its Lagoon; Adriatic Sea; Nile Delta; Red Sea; Gulf of Aden.**

**Introduction**

This trajectory cuts through the North Atlantic, across the continental shelf of theNorth Sea, through to Venice and its lagoon, and beyond to the Adriatic, the SuezCanal and the Red Sea. The coasts of the European peninsula are being rapidlytransformed, with new intensified circulations of people, goods, and energy. Therapid rising of the sea, the overfishing of the continental shelf, new maritimeinfrastructures and protection zones are depicted in this cross-section of Europe as being intertwined with the complex turmoil shaping contemporary Europe. These transformations reverberate well beyond Europe and facilitate a new set of relations and exchanges.

The analysis draws inspiration from the ways the Venetian Republic developed amaritime-based polity. In this longue durée view, Venice acts both as an exampleand a warning: the rich environments of the lagoon are a fragile man-madesystem– supported by a sophisticated polity–, which has embraced over the lasthundred years a disjoined set of measures, distancing the city from its waters andthe relationships it entertained. As experienced dramatically by many people on the move, today's Mediterranean is where Italy no longer meets Africa. Along thistrajectory we ask: How can the seas be remapped as the points of origin for newcollaborations? How can contemporary polities be assembled to reshape vitalcoastal environments? And finally, is it possible to image Venice taking a leading role in fighting climate escalation in a burning world?

**World-System Analysis and Earth-System Theory**

The choice of geographical areas covered by this trajectory is rooted in Immanuel Wallerstein's world-system analysis[88] and Fernand Braudel's account of the Mediterranean through the concept of the *longue durée*—the long-term historical relations that birthed Capitalism and the role of geoecological regions in the formation of these dynamics. For Braudel, geography and climatic conditions play a fundamental role in the formation of civilizations and the sea stands as "the best witness to the Mediterranean's age-old past."[89] If biogeochemical cycles are at the foreground of the history of the region, what are the consequences of these cycles shifting because of new anthropogenic conditions? What are the speculations and the resulting conflations of issues and urgencies that reorganize the contemporary Mediterranean and the societies that surround it?[90]

The North Sea to Red Sea trajectory traverses Braudelian historical centers of world-system capitalist economy, beginning with the maritime powers of the North Sea such as Antwerp, Rotterdam, Amsterdam and London, crossing Venice, and beyond the Adriatic toward Cairo and the Gulf of Aden. The contemporary transportation roads that link the North Sea to the Gulf of Aden through the Adriatic and the Strait of Gibraltar reveal how these historical centers of maritime-based capitalist economies continue to be interlinked by the same shipping routes that structured pre-industrial economic relations.

Venice and its lagoon occupy a central position in this analysis. It is the home of TBA21–Academy's Ocean Space and one of the sites from which *Ocean in Transformation* originates. Venice has been a maritime city for hundreds of years and as Braudel writes, a model for the kinds of spatial organization and integration described by the trajectory: "By 1450, the itineraries of the state galleys alone, that is Venice's official shipping, would if drawn on a map look very like an octopus, with tentacles reaching into the entire area penetrated by Italians outside the peninsula."[91]

To address the fundamental question of what "drives" the accelerated, unpredictable, and unregulated transformation of the world oceans, the multiple trajectories of *Oceans in Transformation* strongly lean on the earth-system theory known as the Gaia hypothesis, developed by James Lovelock and Lynn Margulis. The Gaia theory depicts the earth as synergistic and self-regulating system that created and perpetuates the conditions for life on the planet. The underlying idea of a responsive cohesion between organic existence and inorganic matter propositions a new form of organization of life. Rather than partitioning different registers of knowledge and scientific findings, the Gaia proponents argue for an aggregated understanding of sets of relations that includes earth, ocean, life, climate, atmosphere, inorganic chemistry, microbiology, and so on. According to Lovelock, the earth system "is an 'emergent domain'—a system that has

88. Immanuel Wallerstein, Immanuel Maurice Wallerstein, *The End of the World as We Know It: Social Science for the Twenty-First Century* (Minneapolis: University of Minnesota Press, 1999), 192.

89. Fernand Braudel, *Memory and the Mediterranean* (New York: Vintage, 2002 [1998]).

90. Adrian Lahoud, "The Mediterranean: A new imaginary," *New Geographies 05: The Mediterranean*, ed. Antonio Petrov (Cambridge, MA: Harvard University Press, 2013). Anthony Lodge, *Beyond the Frontiers. Frontex: The First Five Years* (Warsaw: Frontex, 2010)

91. Fernand Braudel and Siân Reynolds, *Out of Italy: Two Centuries of World Domination and Demise* (New York: Europa Editions, 2019 [1989]).

emerged from the reciprocal evolution of organisms and their environment over the eons of life on earth. In this system, the self-regulation of climate and chemical composition are entirely automatic. Self-regulation emerges as the system evolves."[92]

A human-inclusive earth system implies that global-scale social and economic processes—the human imprint—are now becoming significant features in the system's functioning. As the hyper-connectivity of the human enterprise intersects with the pressures on the earth system, concatenated global crises can propagate rapidly through the system—the fundamental proposition of the Anthropocene concept. In terms of planetary stewardship, the ocean carries much of the load in the functioning of the earth system: it modulates climate variability, provides the moisture for most rainfall, and stores much more carbon than the land and atmosphere combined.

While offering a dynamic view of these forces, this trajectory allows anthropogenic stressors affecting the earth system to enter the equation along with historical and social transformations: the discharge of ballast waters and the dispersal of invasive species; trawling; overfishing; oil licensing in the North Sea; chemical and conventional ammunition dumping in the Baltic, North, and Celtic Seas, along the Iberian Coast, and in the Mediterranean; the melting of the permafrost and glaciers of the Alps; hypoxia in the Po delta; migration emergencies on Europe's borders, including the dispersed refugee camps and detention centers in Turkey and Greece triggered by the EU's security crackdown; the erosion of the Nile valley; and the oil supply chain in the Red Sea. These factors all contribute directly or indirectly to the anthropogenic forcing that marks the overall change in the earth's energy balance due to human (economical) activities.

92. James Lovelock, *Gaia: The Practical Science of Planetary Medicine*? (Oxford: Oxford University Press, 2000), 11.

**Sea Level Rise and Acqua Alta**

The multi-disciplinary analysis compiled by this trajectory creates the possibility to connect seemingly disconnected zones around the phenomenon of sea level rise. Coastal Digital Elevation Models (DEMs) that integrate ocean bathymetry and land topography are used for coastal process modelling (inundation, storm surge, sea level rise, contaminant dispersal, and so on), ecosystems management and habitat research, coastal and marine spatial planning, hazard mitigation and community preparedness. In the light of the increasing frequency and magnitude of *Acqua alta* (Venice's cyclical flooding) and the measured and anticipated sea level rise along most European and Mediterranean coasts, this trajectory amalgamates remote sensing data and other observations (like tide gauges) to highlight the coastal zones that are most susceptible to rising seas.[93] The data compiled in the latest Intergovernmental Panel on Climate Change (IPCC) demonstrates that high coastal waters, combined with meteorologically driven surges will play a substantial role with the added effects of coastal floods—in the absence of adaptation measures. A recent study has found that extreme climatic and meteorological convergences put at risk the eastern and southern coasts of the North Sea, the Norwegian coast, the west coast of Great Britain, the coast of northern France, and the eastern coast of the Black Sea.[94]


→ Comitato No Grandi Navi protests in front of the MSC Opera cruise ship after it crashed on the much smaller River Countess harbored at the pier of San Basilio in June 2019. Photo: Pietro Consolandi

A particularly relevant case is the forecasted sea level rise likely to extend to the entire Po Valley by the end of this century. Greece's western coasts, the north of Egypt, the Nile Delta, and the Suez Canal will also be heavily affected. Egypt has been listed among the countries in which sea level rise could have the most catastrophic impact.[95] The Nile Delta, which comprises 63 percent of Egypt's agricultural land, lies below sea level

93. See Permanent Service for Mean Sea Level (PSMSL) https://www.psmsl.org/products/data_coverage/; Centro Previsioni e Segnalazioni Maree (CPSM) https://www.comune.venezia.it/it/content/centro-previsioni-e-segnalazioni-maree; and JRC Maximum Water Extent–Global Surface Water Explorer https://global-surface-water.appspot.com/

94. Emanuele Bevacqua et al., "Higher Probability of Compound Flooding from Precipitation and Storm Surge in Europe under Anthropogenic Climate Change," *Science Advances* vol. 5, no. 9 (September 2019).

95. Susmita Dasgupta, "The Impact of Sea Level Rise on Developing Countries: A Comparative Analysis," World Bank Policy Research Working Paper, 2007.

with an elevation that does not exceed 1 meter. The land is protected from flooding by a 1–10 kilometers wide coastal sand belt that is facing rapid erosion since the construction of the Aswan Dam in the 1960s.[96] Rising sea level is expected to destroy weak parts of the sand belt, which is essential for the protection of lakes and the low-lying reclaimed lands.[97]

The contingencies and potential convergences of the anthropogenic transformations driving the oceans demand solutions that are not limited to engineered protection, such as the project Modulo Sperimentale Elettronico (MOSE). Current climatic urgencies should inspire polities to practice a new culture of care that extends beyond national concerns. They should engage in the redefinition of contemporary space transcending nationalistic horizons to address questions such as: What are the historical and geographical conditions and presuppositions that structure intergovernmental non-profit organizations that aim to establish peace? What mis-communications arise from these structures? How are current coastal urbanization plans shaped by uncoordinated initiatives and forces that characterize today's European connections and relations, extending well beyond its borders? In spite of being the product of intermingling cultures and knowledges, the Mediterranean continues to be a site of dissonance and frictions, perhaps even most evident today in the context of migration across the "Black Mediterranean."

→ Ocean Space at Campo San Lorenzo during the exceptional 'Acqua alta' in November 2019. Photo: Arianna Ferraretto

**The Black Mediterranean and "the Specter of Migration"**

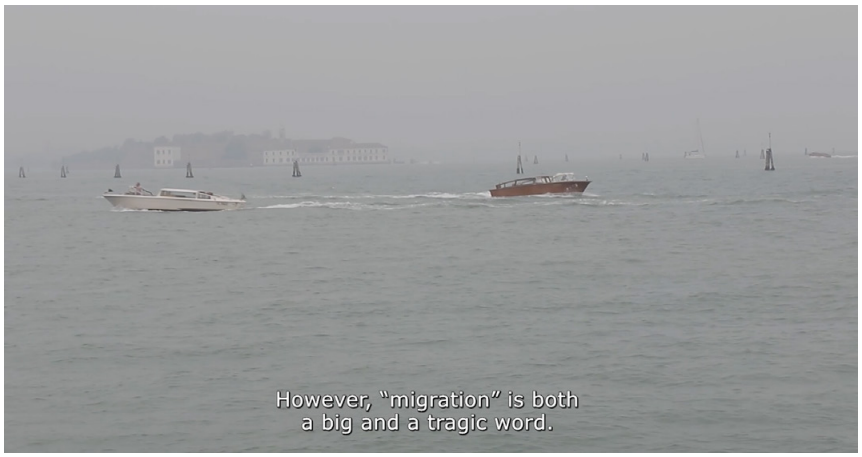
Although migration routes connecting to fortress Europe are mostly sea-based today—as land-based routes have been effectively blockaded since 2016—and thus disproportionately affect Southern European countries, the specter of migration overshadows European realities. Anti-immigrant sentiment, the looming proximity of terrorism, racialized and gendered labor exploitation have been coalescing and driving nationalist politics for past decades. While sparking controversy and igniting heated debates over culture and identity, Europeans are urged to reassess new and old cultural relationships, united, rather than divided by shared experiences of migration and reinvention. For this reason, we choose to select the specter

96. Douglas L. Inman, "Littoral Cells," *Encyclopedia of Coastal Science*, ed. Maurice L. Schwartz (Dordrecht, NL: Springer, 2005), 594–599.

97. Elsharkawy H., Rashed H., & Rached I., "The impacts of SLR on Egypt," 45th ISOCARP Congress, 2009.

of migration as one of the central considerations affecting the entirety of this trajectory.

Drawing on British sociologist Paul Gilroy's conceptualization of the Black Atlantic, which refigures the Atlantic Ocean as a densely networked political and cultural system built around the socio-economy of slavery, Italian scholar Alessandra Di Maio developed the notion of the Black Mediterranean to describe the Mediterranean Sea as a territory of racial subordination and oppression.[98] In the case of the Black Mediterranean, the color black is associated with the metaphor of "burning" (translated from the Arabic word *haraqa*, to burn), which is colloquially used in Mediterranean Africa, from Egypt to Morocco, to designate multiple acts of transgression and potential death. As such, the practices and imaginations of migration, which have been profoundly transformed since the closure of European borders, are increasingly understood as the desirable yet mostly unrealizable and *illegalized* project of reaching Europe.[99]




→ Still from 'Letters from Venice', 2017, produced with ZaLab by the participants of Olafur Eliasson's Green light– An artistic workshop. Photo: Ali Karimi.

In this light, Di Maio reads the burning in two ways: burning bridges with the past, but also starting a new life amidst the deterritorialized experiences of the diaspora. She interprets the Mediterranean both as a transitional place where metamorphosis and transformations take place, birthing new possibilities of becoming, as well as a transnational borderland hosting forms of resistance against the nation-state's neocolonial regulations and oppressions. Reaching beyond the regimes of segregation and division, the Black Mediterranean's protean expanse is figured as "a resonant chamber of the million visual, oral, written, performed stories" of the African and Middle Eastern diasporas[100]. It is conceptualized as a space where creolization begins, rather than where identities are grounded in one place, time, and political framework. "The Black Mediterranean disperses, claims back, re-signifies history through the arts, by interpreting ancient roots and manifesting new, composite, syncretic, contemporary identities."[101]

98. Alessandra Di Maio, "The Mediterranean, or Where Africa Does (Not) Meet Italy," The *Cinemas of Italian Migration: European and Transatlantic Narratives*, ed. Sabine Schrader and Daniel Winkler (Newcastle: Cambridge Scholars Publishing, 2013), 41–52.

99. Stefania Pandolfo, "'The burning': Finitude and the politico-theological imagination of illegal migration," *Anthropological Theory* vol. 7 no. 3 (2007): 329–363. The *harragas* (those who burn) are those migrants who burn their identity papers during the crossing.

100. Awam Amkpa, Manthia Diawara, and Alessandra di Maio, "Conference Folder: ReSignifications: The Black Mediterranean," June 6, 2018, 3, http://tisch.nyu.edu/photo/events/conferences/resignifi cations-the-black-mediterranean.

101. Ibid., 4.

As the Mediterranean Sea borders three continents, it occupies a neuralgic position both in the European geopolitical calculus and the border control pragmatism of the European Union, severely aggravated by recent frontier policies and surveillance efforts. Although several national borders define the Euro-Mediterranean region, particular efforts of border control missions and detention centers are directed toward North Africa and the southern extremities of the Schengen area. Bordering even extends deep into North and Sub-Saharan Africa as a form of "pre-frontiering" and "forward defense system" materialized through treaties and cooperative security frameworks.[102] While Turkey is currently hosting 3.7 million displaced Syrians in a heavily EU subsidized "cordon sanitaire" (and has been effectively absorbing all Syrian migrants since 2016, when it reached a deal with the EU), migration movements have been rerouted almost exclusively to the sea.

Greece, where anti-refugee sentiments are brewing, has been left alone by its European partners to deal with the crisis deepening on its islands, and has euphemistically been promoted to become Europe's "*aspida* (Greek for shield)."[103] Most recently, the governments of Greece and Hungary have been using the Covid-19 outbreak as a vehicle to abolish the right to asylum, the key principle of international refugee law, for at least a month.

Around 20,000 migrants have died in the Mediterranean since 2014, including the number of disappeared persons.[104] These figures, relative to the number of total migrants and the perilous practices involved in crossing the Mediterranean make its waters "the world's deadliest border."[105] Tasked with the responsibility of intercepting migrant vessels and assisting persons in need, the European Border and Coastguard Agency, also known as Frontex, and the European Border Surveillance System, Eurosur, have established a dense web of geospatial intelligence, comprised of remote sensing devices, satellite imaging, and real-time tracking technology. In addition, NATO continuously runs anti-immigration missions directly in the Mediterranean Sea such as Operation Sea Guardian, which aims at "understanding the threats, challenges and opportunities emanating from the south" and "assisting the European Union's Operation Sophia, the EU anti-migrant smuggling operation in the Mediterranean Sea, with situational awareness and logistical support."[106] According to the researcher Monika Halkort, who analyzed the volume of data generated by border security, humanitarian agencies and, activists "it is fair to suggest that irregular migration consti-

102. Lahoud, "The Mediterranean: A new imaginary." Lodge, "Beyond the Frontiers."

103. Jennifer Rankin, "Migration: EU praises Greece as 'shield' after Turkey opens border," *The Guardian* (March 3, 2020), https://www.theguardian.com/world/2020/mar/03/migration-eu-praises-greece-as-shield-after-turkey-opens-border.

104. The UN's International Organization for Migration (IOM) meticulously aggregates overall migration movement around the world. The figures for the Mediterranean are staggering: between 2014 and 2019 over 1 million people have attempted to cross the Mediterranean on the three main sea routes, of whom 230,000 were intercepted, mainly by Turkish, Tunisian, and Libyan coast guards. Nearly 800,000 are listed as "Irregular Arrivals in Europe." International Organization for Migration 2019 report: "Calculating 'Death Rates' in the Context of Migration Journey: Focus on the Central Mediterranean," https://publications.iom.int/system/files/pdf/mortality-rates.pdf. See also https://missingmigrants.iom.int.

105. Maurizio Albahari, *Crimes of Peace: Mediterranean Migrations at the World's Deadliest Border* (University of Pennsylvania Press, 2015).

106. NATO, see website https://www.nato.int/nato-on-the-map/. In March 2019, Operation Sophia halted several naval patrols in the Mediterranean that had rescued thousands of people.

tutes one of the best mapped 'crises' in the history of humanitarianism."[107] And yet very little is known as regards the identities of the dead, whether they were ever retrieved at sea, and what has happened to their remains.

The Black Mediterranean (and its hinterlands) has turned into a deeply racialized zone of value-extraction and a carceral migratory regime facilitated by smugglers, traffickers, illicit businesses, and coastal patrols involved in migrant mobility. Packed into "ghost ships" with hundreds of migrants on board, people of African origin have suffered a huge death toll while attempting to cross the Mediterranean, echoing the historical slave trade and its necropolitics. "The addition of the word *human* to *cargo* does nothing, here, to ameliorate the ghosting these ships do of transatlantic slavery or the afterlives of slavery or the afterlives of property," remarks Christina Sharpe.[108]

In recent years, environmental urgencies have become an increasingly important factor in the displacement of people, in this case, mainly from Sub-Saharan Africa origin. And yet, environmental migrants are not recognized by international law, and no specific agency or international body has been tasked with providing people on the move with assistance and protection. As a result, their numbers are unknown, as are the reasons for their migration. Among the major environmental disruptions are flash floods, droughts, storms, and hurricanes, but also slow violent changes such as sea level rise, contagion through spills and the release of toxic substances, creeping desertification, and deforestation. Many of these disruptions will be aggravated in the years and decades to come, making the question of international cooperation and regulatory frameworks all the more pressing. According to international law expert, Davor Vidas, "various aspects of international law rely on an implicit pretext of the familiar conditions of stability."[109] Laws conceived under the planetary condition of the Holocene prove to be remarkably rigid, relying on the Westphalian model of the nation state and on definitions of sovereign rights over "territories," while in future, Vidas writes, "the emphasis on population and human rights may have to gain in prominence and find expression in new forms of international law subjectivity."[110]

The Mediterranean, once the "cradle of civilization" and the site of fertile cross-pollination of cultures, has become, according to the artists-research group Multiplicity, a thick, solid space "ploughed by predetermined routes, unsurpassable boundaries and subdivided into specialized and strictly regulated bands of water." A "solid sea" whose borders "are surrounded by funnels of entry and exit points that increasingly respond to the logic of exclusion and separation."[111] Migrants, held at bay from European civil societies, nonetheless, "provide a reserve army that can be deployed for cheap employment, below minimum wage and in forcible conditions on

107. Monika Halkort, "Dying in the Technosphere: An intersectional analysis of European migration maps," *Mapping Crisis*, ed. Doug Specht (London: London Consortium for Human Rights, University of London, forthcoming).

108. Christina Sharpe, *In the Wake: On Blackness and Being* (Durham: Duke University Press, 2016), 55.

109. Davor Vidas, "The Earth in the Anthropocene—and the World in the Holocene?," *ESIL Reflection* vol. 4 no. 6 (2015): 5.

110. Ibid., 6.

111. Multiplicity, *Solid Sea*, 2002. Commissioned by Documenta 11.

the European continent."[112] A reserve, it must be added, increasingly drafted according to value, usability and profitability and less on humanitarian grounds.

↑ Allan Sekula, Middle Passage, chapter 3, from Fish Story, 1994
22 Cibachrome prints and 4 text panels. Dimension variable, Thyssen-Bornemisza Art Contemporary Collection, Courtesy the Estate of Allan Sekula, 1994

**Maritime Motorways**

While migration passages are heavily surveyed and effectively blockaded, commercial shipping lanes have been consistently reinforced, making the European waters an ensemble of maritime corridors connected to terrestrial continental routes and inland water courses. While shipping is the "oldest technology of motion," routeing—the invisible lanes etched across the seas and ubiquitous to all the Trajectories—is a contemporary regulatory framework, fundamental to the *smooth* functioning of globalization. It consists of a network of "safe" routes and governed corridors, which keep ships and cargo moving. "'Maritime motorways' or traffic separation schemes are a particular type of 'safe' route that steward shipping in the narrowest and shallowest oceanic 'bottlenecks' worldwide," writes geographer Kimberley Peters.[113] These motorways, Peters argues, are not just separated horizontally but also defined by depth with the aim of separating the invisible subsurface depth of a vessel with the sea floor.

In the 1970s, when the world was opening up to containerized and bulk shipping via larger ships, the Strait of Dover became the testing-space for the first motorway routeing scheme. The need for regulations and mandatory sea-lanes through the Channel and Dover Strait gained

112. Laleh Khalili, "Carceral Seas," *Allan Sekula: OKEANOS*, ed. Cory Scozzari and Daniela Zyman (Berlin: Sternberg Press, 2017), 54.
113. Kimberley Peters, "Deep Routeing and the Making of 'Maritime Motorways': Beyond Surficial Geographies of Connection for Governing Global Shipping," *Geopolitics* vol. 25, no. 1 (January 2020): 45, https://doi.org/10.1080/14650045.2019.1567499.

momentum following a series of maritime accidents and collisions.[114] In 2001, the EU introduced the Motorways of the Sea, which aimed to establish new intermodal maritime-based logistics chains in Europe, improve transport organization, and offer "a real competitive alternative to land transport." Four "corridors" were designated as being of European interest:

Motorway of the Baltic Sea (linking the Baltic Sea Member States with Member States in Central and Western Europe, including the route through the North Sea/Baltic Sea canal);
Motorway of the Sea of western Europe (leading from Portugal and Spain via the Atlantic Arc to the North Sea and the Irish Sea);
Motorway of the Sea of south-east Europe (connecting the Adriatic Sea to the Ionian Sea and the Eastern Mediterranean, including Cyprus);
Motorway of the Sea of south-west Europe (western Mediterranean, connecting Spain, France, Italy and including Malta and linking with the Motorway of the Sea of south-east Europe and including links to the Black Sea).[115]

The Mediterranean Sea is among the world's busiest waterways. Shipping passing through the deep basin—from the Straits of Gibraltar and the Bosporus to the Suez Canal, from the Black Sea to the Atlantic—represents 30 percent of all international maritime transport.[116] In intra-EU trade, northern ports handle a larger volume than southern ones: Antwerp is the main port of entry and exit for Mediterranean traffic, excluding oil. Rotterdam, the largest European port, handles both containers and bulk shipment. For what concerns the maritime trade between Mediterranean countries and the rest of the world, the most important amount of trade takes place between the EU and countries in Asia and the Middle East.[117]

Other important maritime waterways are the Bosporus, which links the Black Sea to the Marmara Sea, ultimately connecting to the Atlantic Ocean and forming a boundary between Europe and Asia; the Strait of Hormuz that connects the Gulf of Oman with the Persian Gulf; and the waterways of the Suez Canal joins the Mediterranean and the Arabian Sea, used for the delivery of oil from the Persian Gulf and passing through the Gulf of Aden in the southeast.

Shipping routes are, in fact, extensions of terrestrial roads and form national and international networks that provide the infrastructure for the trade of goods through maritime services.[118] Maritime infrastructures, such as ports and canals, have continuously been enlarged and adapted for larger vessels and expanded traffic efficiency. The International Transport Forum has assessed that the average vessel size has increased

114. Ibid., 52–54.
115. European Commission, "Motorways of the Sea" https://ec.europa.eu/transport/modes/maritime/motorways_sea_en
116. Tom Vaes and Jean-Noël Druon, Joint Research Centre of the European Commission Science and Policy report: "Mapping of potential risk of ship strike with fin whales in the Western Mediterranean Sea: A scientific and technical review using the potential habitat of fin whales and the effective vessel density." (2013).s
117. Christian Reynaud,. The Components of Maritime Transport in the Mediterranean," *IEMEd Anuari de la Mediterrània* (2009): 255–259.
118. Many routes have long-standing historic uses and have been inquired into as ways of tracking the socio-cultural and political worlds of slavery, colonialism, and imperialism. The British perfected the concept of "sea lanes" as spaces for the assertion of their control over trade and in competition with other European powers.

by 79 percent between 2007 and 2014 and is expected to continue rising. The prospect of receiving bigger ships has amplified the competitive dynamics between urban centers and nations seeking to harvest the revenue associated with increased maritime traffic. To handle the increased volume of trade and the growing number of mega-ships, ports and nations bordering maritime straits and channels worldwide are massively investing in upgrading their infrastructure. Most importantly, the expansion of the Suez Canal, adding a second shipping line in the canal that allows for ships to pass in opposite directions, completed in 2015, increased the optimization of transit for new classes of ships known as Ultra Large Container Vessels (ULCVs).[119] And yet, mobility studies have only recently focused on movement, on the lines and paths that weave together into the complex meshwork of supply chains.

**Maritime Supply Chain**

"Where did logistics get this ambition to connect bodies, objects, affects, information, without subjects, without the formality of subjects, as if it could reign sovereign over the informal, the concrete and generative indeterminacy of material life? [...] Modern logistics is founded with the first great movement of commodities, the ones that could speak. It was founded in the Atlantic slave trade, founded against the Atlantic slave."– Stefano Harney and Fred Moten [120]

With about 90 percent of global production of goods, components, dry cargo, and solid fuel shipped via ocean transit across the planet, the maritime supply chain has become a non-localized, transboundary network connected by superships and monitored by geospatial intelligence, as well as a monstrous physical infrastructure of super-ports, economic Free Trade Zones (FTZs), and tightly connected low-cost labor hinterlands.

The ports of Rotterdam, Antwerp, and Hamburg rank among the top twenty container terminals worldwide.[121] These ports are integrated within European trade via the short shipping routes along the Atlantic Arc and through the Strait of Gibraltar, with Antwerp being the main port of entry and exit for Mediterranean traffic. Partnerships between these regions are facilitated by the North Sea Commission, which also promotes the northern maritime region as an economic entity within the European Union. In an effort to reach a "green supply chain management," the multi-port region of the Rhine–Meuse–Scheldt delta is engaging with long-term strategies aimed at reducing its environmental impacts (green shipping, green port development and operations, and green inland logistics, seaports, and circular economy).[122] While these managerial changes may come from benevolent objectives and efforts to "integrate environmental thinking into supply-chain management," their implementation is long overdue and is far from addressing the full extent of the impact of port logistics on

119. United Nations Conference on Trade and Development report: Review of Maritime Transport 2016 (2017), 21.

120. Stefano Harney and Fred Moten, *The Undercommons: Fugitive Planning & Black Study* (New York: Minor Compositions, 2013), 92.

121. Their respective ranking is 11, 14, and 18. See the 2019 UNCTAD Report, 69.

122. Theo Notteboom, et al., "The Role of Seaports in Green Supply Chain Management: Initiatives, Attitudes, and Perspectives in Rotterdam, Antwerp, North Sea Port, and Zeebrugge," *Sustainability* vol. 12 no. 4 (2020), 1688.

marine pollution, the introduction of so-called invasive species with ballast water, and climate change, issues that in turn pose devastating threats of rising sea level in the reclaimed land of the Netherlands and the rest of the northern European coastline.[123]

The maritime industry's cornucopian project of "greening" its economy also implies the use of smart technologies and manned labor replacement by automation. The Port of Rotterdam is Europe's first "smart port," where most of the container loading and stacking is handled by Unmanned Automated Stacking Cranes (ASC) and remote-controlled, "Zero $CO_2$" chariots. In January 2016, 3,600 workers from the Port of Rotterdam went on strike to protest against the expected loss of hundreds of jobs to automation. As a result of the strike, the port authority agreed not to cut jobs, and told a reporter that "although some jobs will be replaced by automation, that doesn't mean there will be less work. Instead, jobs will change, or new jobs will be developed."[124]

Flowing along the hyper-coordinated sequence of transportation procedures, raw materials, semi-finished goods, commodities, and labor inputs are being shaped into products delivered in a timely fashion to dealers and end-consumers. Supply chain capitalism is characteristic of all globalized corporations and has become particularly vital for networked companies. What was once a rigid, linear flow is no longer even a chain at all but rather a flexible "value network designed to deliver instant choice and hyper-personalization across a variety of fulfilment channels and an expanding range of digital enablers."[125] The global supply network is no longer a fixed architecture, but a flow chart and a dynamic algorithm. This dynamic, data- and AI-driven stage is the domain of logistics, the strategic intelligence that harmonizes production, circulation, and consumption.

The restructuring of ports into concentric hub-and-spoke networks[126] has concentrated capital, activity, and infrastructure investment in a limited number of large ports. Port expansion has indeed become a gigantic and ongoing effort, involving the dredging of deep channels, land reclamation, the terraforming of coastal zones, and the creation of artificial islands. Connected to railroad systems, highways, and intermodal networks and merging with all-powerful free trade zones (FTZs)—formerly conceived as freeports and today instruments of what Keller Easterling has termed "Extrastatecraft": "Conglomerates such as PSA (Port of Singapore Authority), P&O, Hutchison Port Holdings, and ECT (European Container Terminals) serve as post-colonial counterparts of the old British or Dutch East India Company franchises. To container ports around the world, they deliver automated transshipment and warehousing

123. The Intergovernmental Panel on Climate Change predicts that sea levels will rise by 30–60 centimeters by 2100, even if the Paris Climate Accord pledges are met. In the Netherlands—where one-third of the land lies below sea level—the problem poses such a threat that a Dutch government scientist has proposed building two mammoth dams to completely enclose the North Sea, thereby protecting northern European states bordering the sea from the consequences of rising temperatures.

124. "Rotterdam: The Smartest Port in the World," *World Trade Matters* issue 3: 44. https://issuu.com/sampileggi/docs/wtm-3_final.

125. Lindsey Mazza, "Transforming from a supply chain to a supply network," *Supply Chain Digital* (April 10, 2020), https://www.supplychaindigital.com/supply-chain-management/transforming-supply-chain-supply-network.

126. "Point-to-Point versus Hub-and-Spoke Networks," https://transportgeography.org/?page_id=653.

technologies, 'just-in-time' management techniques, and other materials-handling expertise for sorting and tracking all of the contents of all of the containers moving between zones on increasingly larger and larger ships."[127]

The radical transformation from vertically integrated local supply chains to highly decentralized global supply chain networks has been fueled by the emergence of low-cost outsourcing options in Brazil, Russia, India, China, and other countries. These globalized "business ecosystems" are also deeply entangled with the histories of colonialism, maritime labor, the speculative instruments of global finance, the threat of sea level rise, and the ecological consequences "of an infrastructural imagination that have carved a trading zone out of the liquid architecture of the sea."[128]

**North Sea Continental Shelf**

The North Sea, a gas- and mineral-rich marginal sea lying between the eastern coast of Great Britain and the northwestern part of continental Europe, provided the setting in 1968 for the first judicial decision by the International Court of Justice (ICJ) concerning the delimitation of maritime zones beyond the territorial sea. The decision of the ICJ in the North Sea Continental Shelf Cases is a cause célèbre for its articulation of important principles relating to the doctrine of the Continental Shelf. Beyond matters of law, the court's ruling implicated important notions as regards the "ideology"[129] of national sovereignty over submarine areas and resources, the importance of geology and geomorphology in the classification of national territory, and the effect of customs on international treaties.

Indeed, the court's approach was to conceptualize the continental shelf as the "natural prolongation"[130] of the coastal state's land territory. This proposition went against the standing definition of the concept enshrined in the UN Convention on the Continental Shelf from 1958. The 1958 convention placed the seaward limit of the continental shelf at the point where the waters reach a depth of 200 meters or, beyond that limit, where the depth of the waters permits exploitation of the natural resources of the seabed and subsoil.[131] The boundless possibilities of exploitation of the continental shelf, only limited by technological advancement, was driven by the discoveries of oil and gas in coastal waters.[132]

127. Keller Easterling, *Extrastatecraft: The Power of Infrastructure Space* (New York: Verso, 2014).

128. Susan Schuppli, "Introduction," *FutureLand: Stories from the Global Supply Chain* (Goldsmiths University of London Centre for Research Architecture, 2017), 7.

129. Territorial Agency, Interview with Davor Vidas, Fridtjof Nansen Institute, Oslo, November 5, 2013. Unpublished.

130. Bin Bing Jia, "The Notion of Natural Prolongation in the Current Regime of the Continental Shelf: An Afterlife?" *Chinese Journal of International Law* vol. 12 (2013): 84–85.

131. Convention on the Continental Shelf (signed 29 April 1958, entered into force 10 June 1964) 499 UNTS 311 (hereinafter 1958 Convention), Article 1.

132. In Europe, the discovery of the Netherlands's huge Groningen Gas Field in 1959 tremendously boosted the interest in the possibility of discovering hydrocarbons on the North Sea Continental Shelf. In 1964, legislation was enacted in the United Kingdom authorizing the granting of licenses for the production of hydrocarbons. At the time, fifty companies were granted such licenses. In 1965, Norway granted production licenses to twenty-four entities. As of August 1, 1967, eighty-three wells had been drilled on the Continental Shelf underlying the North Sea and sizable gas reserves had been discovered in the United Kingdom.

By introducing the concept of natural prolongation, rather than using a fixed measurement uncoupled from the shelf's geomorphology (based on the idea of proximity and equity between neighboring states rather than geology), the court limited the extent to which exploitation was permitted. However, and most importantly, the decision promoted the new idea that the coastal state has an inherent entitlement over the continental shelf—its title of sovereignty—over the territory lying below the sea. "To the extent that the state enjoys sovereignty over land territory, it enjoys title over the areas which, although covered with seawater, 'may be deemed to be actually part of [that] territory,' in the sense that they are an extension—a prolongation—of that territory under the sea."[133] In consequence, the court asserted the principle that the land dominates the sea.[134]

The ICJ's opinion was reconsidered in the process of revision of the definition of the continental shelf during the Third UN Conference on the Law of the Sea. According to the UNCLOS doctrine, the state's sovereignty is delimited by its territorial waters that extend to 12 nautical miles from the coast. The continental shelf (i.e. a state's Exclusive Economic Zone [EEZ]) extends throughout the natural prolongation of the coastal state's land territory to the outer edge of the continental margin, or to a distance of 200 nautical miles from the baseline.[135] Within the EEZ, a state enjoys undivided rights (however not full sovereignty) over marine resources as well as rights of energy production.[136] In the case that a country's so-called "outer continental shelf" exceeds 200nm (based on geological features), countries have rights of the seabed of up to 350 nautical miles from the baseline.

This new definition cites the concept of "natural prolongation," however, it bases the EEZ on a fixed distance criterion. Distance from baseline provides the new legal basis for the entitlement to continental shelf rights, with exception of the outer shelf limit. By decoupling the definition of the continental shelf from geology, UNCLOS introduces the new paradigm of the baselines. Ironically, the concept of the baseline relies even more precariously on geomorphological features than the previous ICJ opinion. According to Vidas, this concept opens a set of new issues, directly related to the Anthropocene transformation of the oceans. "What is the cornerstone of the entire building of the law of the sea, of its core architecture, is something that is called baseline. Baseline is, in many respects, coast. It's called normal baseline. Or it can be a certain geometrical line which connects features of indented coast."[137]

The entire "architectural construction" of a right over territory relies on the assumption of stability, considering the coast as an objective, stable criterion for demarcation. The assumption of stability is based on the con-

133. Nikiforos Panagis and Antonios Tzanakopoulos, "The North Sea Continental Shelf Cases: Landmark or High Watermark?", *Oxford Legal Studies Research Paper* no. 35 (2017): 30. https://ssrn.com/abstract=2954626.

134. NSCS para 96. This is one of the most ancient principles of the law of the sea, see Hugo Grotius, *De jure belli et pacis libri tres, vol I* (originally published 1625, trans. by William Whewell. Cambridge: John Parker, 1853) chapter III, paragraph VIII. It is also echoed in the so-called Truman Proclamation, whose preamble characterized the continental shelf as "an extension of the landmass of the coastal nation and thus naturally appurtenant to it."

135. UNCLOS (signed December 10, 1982, entered into force November 16, 1994), 1833 UNTS 397.

136. https://www.un.org/depts/los/convention_agreements/convention_overview_convention.htm

137. Territorial Agency, Interview with Davor Vidas, 2013.

tinuous conditions of the Holocene, as recorded over the past 11,700 years. But what will happen when the sea level rises in unpredictable ways in the coming years? If island nations disappear, if their habitation can no longer be sustained, and if states claim that certain, uninhabited island formations are part of their borders? Addressing the challenges posed by the anthropogenic transformations restructuring conditions on the planet, their consequences for international law, the law of the sea and human rights, Vidas foresees great challenges and reconsiderations of the way in which international law asserts sovereign rights over territory. In such future expressions, geology might find a new relevance for the future development of international law.

**Chemical and Conventional Ammunition Dumping**

In the decades following World War I, and even more pressingly during and after World War II, German and allied governments were faced with the necessity of finding a fast and seemingly economical way of disposing enormous quantities of obsolete conventional and chemical ammunition. As usual methods of destruction—like detonation and burning—proved to be time-consuming and dangerous, another politics of negligence was adopted, namely, dumping this material into the oceans.

→ HMS Queen Mary explodes during the Battle of Jutland, 1916, author unknown, public domain

Decommissioned ammunition has been either jettisoned unfettered or loaded as cargo onto ships that were sunk by opening their seacocks or by naval artillery fire. Sunken ships tend to settle on the seabed largely intact while unfettered material can be widely dispersed by currents and tides, causing damages to fisheries and other marine ecosystems. Numerous investigations have shown that the factors that contribute to the degradation and spread of chemical warfare agents—namely currents, ocean temperature, and depth—vary greatly between dumpsites.[138] Aside from potentially self-detonating at any given time, these sunken nests of ammunition present other threats, for example, the possibility of access to the ammunition by

138. Peter G. Brewer and Noriko Nakayama, "What Lies Beneath: A Plea for Complete Information," *Environmental Science & Technology* (2008): 1395–1396.

terrorist and right-wing extremist organization and the catching of ammunition and its content by commercial fishing with resulting contamination of the catch.

In the Baltic Sea, data indicates that most conventional ammunition was dumped off in the proximity of the German Baltic coast, while large dumping sites for chemical ammunition are located in the Skagerrak and the Bornholm Basin.[139] In the North Sea, investigations have shown that a large dumping site off the Scottish coast, in the Beaufort's Dyke trench, holds more than a million tons of bombs, rockets, and shells, including 14,000 tons of rockets with phosgene poison gas warheads from WWII, making Boris Johnson's plans to build a bridge connecting Northern Ireland and Scotland impossible.[140] The British government used an underwater valley in the English Channel known as Hurd's Deep to dump munitions and weapons after WWII. From 1946–48, the British government also dumped large amounts of chemical munitions in the Celtic Seas, in the North-East Atlantic.

The dumpings have been reported by the Oslo-Paris Commission (OSPAR), which in 1992 conducted a convention for the Protection of the Marine Environment of the North-East Atlantic. The convention combined and updated the 1972 Oslo Convention on dumping waste at sea and the 1974 Paris Convention on land-based sources of marine pollution. OSPAR, composed by representatives of fifteen governments in Europe, stands as the current legislative instrument regulating international cooperation on environmental protection in the North-East Atlantic. The commission conducts regular assessments of the status of the marine environment in the North-East Atlantic.

Whereas some dumping operations have been carefully undertaken, including the keeping of details, most were done haphazardly. This has been the case in the Mediterranean Sea, where spots of World War II chemical weapons and ammunition dumping by Nazi Germany and the US Army in the Adriatic and Ionian seas have been discovered by the International Dialogue on Underwater Munitions (IDUM). In 1944, the Nazi military began dumping a large, but unknown, number of chemical weapons in the Adriatic Sea off the coasts of Urbino and Pesaro, Italy. The depot from which the dumped chemical weapons originated contained 9,844 tons of it.[141]

The mission of the IDUM, founded by former Canadian military engineer Terrance P. Long, is to "promote the creation of an Internationally Binding Treaty on all classes (biological, chemical, conventional, and radiological) of underwater munitions."[142] The IDUM's work has been recognized by the UN in the 2014 UN Resolution on Sea Dumped Munitions, which

139. See "Chemical and conventional ammunition in the Baltic Sea" in Coastal Wiki. http://www.coastalwiki.org/wiki/Chemical_and_conventional_ammunition_in_the_Baltic_Sea

140. Dan Sabbagh, "Bombs dumped in Irish Sea make bridge plan 'too dangerous" *The Guardian* (February 14, 2020). https://www.theguardian.com/politics/2020/feb/14/bombs-dumped-in-irish-sea-make-bridge-plan-too-dangerous

141. Chemical Weapons Material Dumped at Sea—Interactive Map by the Center for Non Proliferation Studies https://www.google.com/maps/d/viewer?ll=5.3682923785704935 percent2C0&z=2&mid=1ALnyOrN5JQ8H50znwJqI_Sj8IwE. See also the Documentary *Deadly Depths* co-directed by Bob Coen, Eric Nadler, and Nicolas Koutsikas (2014).

142. IDUM, http://underwatermunitions.org/about-us/

prompted cooperative measures to assess and increase awareness of environmental effects related to waste originating from chemical munitions dumped at sea.

Information on munition dumping locations shown in this trajectory is based on an open access-dataset on munition dumping provided by the European Marine Observation and Data Network (EMODnet).

**Belt and Road Initiative in East Africa**

China's Belt and Road Initiative (BRI, formerly known as One Belt One Road Initiative), launched in 2013, aims to establish new trading routes by further connecting China, Asia, Europe, and Africa along five integrated pathways. This highly contested, long-term project envisages the construction of a trade and transport infrastructure network on land ("belt") and water ("road") involving nearly seventy countries and accounting for 60 per cent of the world's population. While reviving the historical imaginary of the peaceful cooperation between cultures and nations along the ancient Silk Road, the Belt and Road project clearly aims at reinstating China as a dominant power and to reorganize and transform the whole of Eurasia and beyond. Researcher Jegan Vincent de Paul identifies in "the discursive events and materials of the Belt and Road project [...] the super-narrative of a potential world order."[143] Chinese President Xi Jinping describes it as a "community of common destiny for mankind,"[144] and as his vision for transforming global governance.

Besides the construction of ports, pipelines, and railways, the BRI strives for increasing cooperation and exchange in fields such as technology, resources, tourism, environment protection, the work of NGOs, and many other areas of cooperation. Projects within the scope of the BRI are financed by the China EximBank or by new funding instruments initiated by China.[145] The maritime silk road for the twenty-first century is supposed to extend along Africa's eastern coast through the Suez Canal, but also on coasts of Central and West Africa. Some ports are to be connected to Africa's hinterland by roads and railways in such magnitude that analysts speak of a "second belt" on the African continent.[146]

The hotspots of China's engagement in Africa within the scope of this trajectory are Egypt, Ethiopia, and Djibouti. Already heavily invested in the development of Egypt's Suez Canal Corridor, a Chinese company signed a contract to construct the new multipurpose terminal at the Port of Alexandria. The port is operated by the Hong Kong–based company Hutchison Ports. Egypt is, in fact, the portal to global markets; more than 192 global companies operate through the Suez Canal, while 5 percent of international oil shipments and 10 percent of global trade pass through the canal.

143. Jegan Vincent de Paul, "Transcending History: Considering a Belt and Road Archive," in *Allan Sekula: OKEANOS*, 261.

144. Liza Tobin, "Xi's Vision for Transforming Global Governance: A Strategic Challenge for Washington and Its Allies," *Texas National Security Review* (November 12, 2018).

145. Baker McKenzie 2017 report: "Belt & Road: Opportunity and Risk, The Prospects of Building China's New Silk Road." https://www.bakermckenzie.com//media/files/insight/publications/2017/10/beltroad/baker mckenzie belt road report 2017.pdf?la=en.

146. Julia Breuer, "One Belt, One Road?," *Blickwechsel* (2017): 1–8.

In Djibouti, a strategically well-positioned country on the Indian Ocean, the Port of Doraleh was built in less than two years and jointly financed by China Merchant Holdings and the Djibouti Ports and the Free Zones Authority (DPFZA).

Simultaneously, a Chinese military base was opened in 2016 (alongside the existing US, Japanese, and French garrisons). Doraleh Port is also well-connected to Djibouti's resource-rich neighbor Ethiopia: a railroad from Addis Ababa to the Doraleh Port as well as a pipeline from Ogaden (Ethiopia) to Djibouti are already operational. The 759-kilometer long Addis Ababa–Djibouti Railway was financed by Chinese EximBank and built by China Railway Group and China Civil Engineering Construction Corporation. Both the port and the railway started operating in 2017 and will be linked with the Kenya Standard Gauge Railway (SGR).[147]

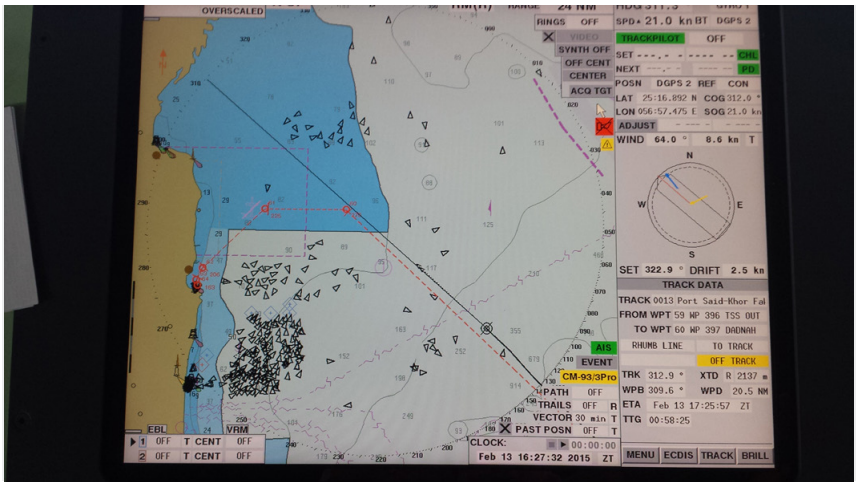
**The Oil Supply Chains**

"Oil represents liquid wealth, both literally and economically: it enables and expands industry, transport, energy systems, and it sustains and articulates enormous sources of financial transactions. Petroleum is a connector, a dynamic vector that links the earth system to the world-system (Wallerstein). A vector of diffused and accumulated power, with leverage in both day-to-day activities of the world-economy and in the political circuits of many nation states." —Territorial Agency, "The Museum of Oil"

↑ USS Iwo Jima transits through the Suez Canal.
Photo: Official U.S. Navy Imagery.
Image is licensed under CC BY 2.0

147. Ibid.

According to data published by the Suez Canal Authority, in 2016, 3.9 million barrels of total oil (crude oil and refined products) transited the Suez Canal per day.[148] This represents about 10 percent of world maritime oil trade and about 17 percent of total Suez cargo, measured by net metric tonnage.[149] The waterway of the oil supply chain shown in this trajectory is punctuated by a series of chokepoints: the Suez Canal, the Strait of Bab el-Mandeb, and the Strait of Hormuz. Despite being considerably narrow—although the fixed narrowness of these straits is in part accentuated by the economies of scale and the resulting growing sizes of supertankers—these chokepoints affects markets at a global level. Changes in policies within these marine regions may cause drastic economic impacts for nations thousands of kilometers away. Being part of, and shaping, an infrastructure of oil trade that has produced conflict zones, where violent geopolitics culminate, these straits and canals materialize a "geopolitics of narrowness" where numerous foreign countries hold stakes.




→ Image from ship's equipment during a journey in the Gulf of Oman. The cluster of triangles towards the bottom left are ships at anchor near the bunkering port of Fujairah in the UAE.

The entire African coast of the Suez Canal is heavily militarized and punctuated with watch towers at every kilometer. The man-made, and nationalized, transitionary nexus has proven its position as a chokehold for global economies during two periods of closures, once during the Suez Crisis of 1956 and again during the Six-Day War in 1967. The closures caused massive shocks to British and European economies, with the increase of oil prices causing disruptions in everyday consumer prices and even a spike in immigration from the UK to Commonwealth countries.[150] In 2014, Egyptian President Abdel Fattah el-Sisi launched the Suez Canal Corridor Area Project, an 8.5 billion dollar enlargement project which included building a new canal (72 kilometers long, 400 meters wide, and

148. https://www.eia.gov/international/analysis/special-topics/World_Oil_Transit_Chokepoints

149. The oil industry is composed of three main segments: the exploration and production of crude oil ("upstream"), the refining of crude oil into finished products, and the distribution/sale of those products to end consumers (both known as "downstream"). Some of the oldest companies involved in this industry have evolved to become Major International Oil Companies (IOCs), three of which are based in Europe. European refineries receive crude oil from a wide range of sources, which include the North Sea (32 percent), the Russia/CIS region (35 percent), the Middle East (18 percent), and North and West Africa (15 percent). See the European Petroleum Association report: "Overview of the European Petrolium Industry." https://www.fuelseurope.eu/wp-content/uploads/2017/05/pg_study_-_for_external_use-2009-03308-01-e.pdf

150. Laleh Khalili "How the (closure of the) Suez Canal changed the world," *The Gamming* (August 31, 2014). https://thegamming.org/2014/08/31/how-the-closure-of-the-suez-canal-changed-the-world/

24 meters deep) that runs parallel to the original canal and widening parts of the existing canal to facilitate traffic flow in both directions. Reopened in August 2015, the record-breaking dredging operation was accomplished in just one year.

Speaking of these oil supply routes, international politics scholar Laleh Khalili considers that "from the Napoleonic era to the present day, waging war has gone hand in hand with building roads."[151] This is evident in the maritime capitalist project connecting the Arabian Peninsula to European markets, in particular the route that connects the Bab el-Mandeb Strait to the Gulf of Aden and the Suez Canal, which is the most militarized section of the oil supply chain in question. The maritime area has been a hotspot for petro-piracy and terrorism for decades and is also populated by foreign warships, most of which belong to the US Navy as the Fifth Fleet has been responsible for naval forces in the Persian Gulf, Red Sea, Arabian Sea, and parts of the Indian Ocean since 1995. However, as Khalili demonstrates, the militarization took place long before issues of piracy emerged, meaning that the "securitization" of these routes is constitutive of the whole process of trade. The infrastructure of the market is the same infrastructure used for military purposes, making the geopolitics of war crucial to the politics of capital accumulation in the Gulf. This co-constitutive relationship is actualized through sets of processes that normalize military presence through what Khalili refers to as "a discourse of reassurance."[152]

→ Oily pollutants released by an unidentified ship in the Gulf of Oman.

The deterritorialization of oil has made it a ubiquitous factor in the technocratic process of modern planning. The events unfolding along the oil supply chain connecting the Arabian Peninsula to the Mediterranean and the North Sea show that the extraction and burning of oil does not only put the land, the atmosphere, and the oceans in a deadly cycle of human-induced transformations. Oil also infiltrates geopolitics, the production of culture, and almost all realms of public knowledge. In the research exhibition "The Museum of Oil" (2015), Territorial Agency provided a cognitive mapping of

151. Laleh Khalili, "The Roads to Power: The Infrastructure of Counter-Insurgency," *World Policy Journal* vol. 34 no. 1 (April 2017).

152. Laleh Khalili, "The geopolitics of maritime transportation in the Middle East," (podcast, recorded May 18, 2015), *The Funambulist*. https://thefunambulist.net/podcast/laleh-khalili-the-geopolitics-of-maritime-transportation-in-the-middle-east. In 2016, Khalili embarked on a ship from Malta to Strait of Hormuz. Her blog entries from the voyage can be seen on her website: https://thegamming.org/2017/02/23/malta-dubai-18-august-2016-day-9-transitting-suez/.

the geographical data around fossil fuels extraction, exposing the inevitable co-relations between oil extraction and modern conflicts. The project states that the geopolitical frictions, infrastructures of war, and the irreparable atmospheric consequences of the oil industry can be stopped by one simple action, or rather inaction: keeping oil in the ground, where it has been for millennia.[153] In the technosphere, the dominating paradigm of energy consumption, the rate of decarbonization of the energy system is significantly slower than the global energy consumption growth. If decarbonization entails changing all infrastructures, narratives and cultures, what forms of planning need to be imagined? What role can the oceans and the knowledges that are produced have in the formation of new paradigms of energy production?

**Depleted Fisheries**

The 2018 State of World Fisheries and Aquaculture (SOFIA) report, published by the Food and Agriculture Organization of the United Nations (FAO) confirmed a global trend toward unsustainable fishing. Two-thirds of global fisheries are in poor health, overfished, and getting worse, while many of the remaining better-managed fisheries are not yet sufficiently recovered to be economically viable and many stocks continue to dangerously decline. One of the most worrying findings from the SOFIA report is the extent of the overfishing crisis in the Mediterranean and the Black Sea. These maritime regions are believed to be the most overfished seas in the world, with 62 percent of fish stocks facing depletion.[154] Another alarming case is the collapse of the cod population in the North Sea, as reported by the International Council for the Exploration of the Sea (ICES), which has recommended a 70 percent reduction in catch limits.[155]

While there seems to be a wide consensus on these trends, the collection of precise data remains a challenge as overfishing is constituted by numerous invisible and illegal activities that are difficult to identify. Several additional factors, such as the neglect of small-scale fisheries, illegal and other unregulated fisheries, as well as discarded bycatch, also display a need for improved monitoring of all fisheries. These concerns have been raised by marine biologists Daniel Pauly and Dirk Zeller, who have presented the results of an approach called "catch reconstruction," which "utilizes a wide variety of data and information sources to derive estimates for all fisheries components missing from the official reported data."[156] Pauly and Zeller have found that between 1950 and 2010, "reconstructed" global catches were fifty percent higher than data reported to FAO, and have been declining more strongly since catches peaked in the 1990s (specifically in the cases of the Mediterranean and the Black Sea).

153. See Territorial Agency's "Museum of Oil," a project produced by ZKM in 2016. To put the oil industry into the museum means make it a thing of the past. To make sure that oil is kept in the ground, "The Museum of Oil" sets out to register and outline how the oil industry has stretched itself so far that its territories have become fragile and untenable.

154. FAO 2018 report: "The State of World Fisheries and Aquaculture 2018 - Meeting the sustainable development goals." Rome. License: CC BY-NC-SA 3.0 IGO

155. CES Advisory Committee 2019 report: "Cod (Gadus morhua) in Subarea 4, Division 7.d, and Subdivision 20 (North Sea, eastern English Channel, Skagerrak)." https://doi.org/10.17895/ices.advice.5640.

156. Daniel Pauly and Dirk Zeller, "Catch reconstructions reveal that global marine fisheries catches are higher than reported and declining," *Nature Communications* vol. 7. doi: 10.1038/ncomms10244 (2016).

↑ Allan Sekula, Middle Passage, chapter 3, Fish Story, 1994, Thyssen-Bornemisza Art Contemporary Collection, Courtesy: The Estate of Allan Sekula, 1994

The results arising from this meticulous data reconstruction processes point to a wider issue, which Pauly had termed the "shifting baseline" in 1995.[157] The shifting baseline describes the process by which the correct "baseline" of a fishery population is sometimes incorrectly calculated as it is based on data that does not precede human exploitation. Whenever a natural condition is being re-established, "nature" is brought back to a condition that has been imagined by humans, a perception that is unaware of some depletion. Indeed, overfishing precedes all other pervasive human disturbance to coastal ecosystems, including pollution, degradation of water quality, and anthropogenic climate change. In the case of the Mediterranean, the shifting baseline stretches over a long lag. As mentioned by marine paleo-biologist Jeremy Jackson, most discourse on fishing in the Mediterranean sustains the idea that the sea has been overfished since the 1960s, due to the arrival of industrialized fishing techniques, but fishing actually intensified sufficiently to drastically deplete certain Mediterranean fish stocks by the time of the Roman Empire.[158] "In the Mediterranean," says Jackson, "where civilization began in a big scale of three thousand, four thousand years ago, we wiped out most of the big stuff more than a

157. Daniel Pauly, "Anecdotes and the shifting baseline syndrome of fisheries," *TREE* vol. 10, no. 10 (October 1995). http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.737.5584&rep=rep1&type=pdf

158. See Jeremy Jackson interviewed in the Smithsonian Tropical Research Institute, https://stri.si.edu/scientist/jeremy-jackson.

thousand years ago except for the migrating blue fin tuna which are now almost gone, but which persisted well into the eighteenth, nineteenth century in huge abundance."[159]

EU fishing fleets and the conservation of fish stocks in the North, Mediterranean, and Black seas are regulated by the EU's Common Fisheries Policy, which is "designed to manage a common resource, it gives all European fishing fleets equal access to EU waters and fishing grounds and allows fishermen to compete fairly."[160] Maintaining fishing under the "Maximum Sustainable Yield" (MSY) is one of the policy's key objectives.[161] The MSY for a given fish stock means the "highest possible annual catch" that can be sustained over time, by keeping the stock at the level producing maximum growth. It is, in other words, a sort of baseline on which the sustainability of biomass is conceived and planned. As anticipated above, the problem lies in what kind of data informs this baseline, which in the case of MSY is not clearly specified. Although the MSY approach is widely practiced by state agencies governing wildlife, forests, and fisheries, it has been heavily criticized by ecologists. One of the main problems with MSY is its static interpretation (a fixed catch that can be taken year after year), which is generally not appropriate as a "management goal" because it ignores the fact that fish populations undergo natural fluctuations in abundance (meaning, MSY treats the environment as unvarying), and will become severely depleted under a constant-catch strategy.[162]

**Warm water corals of the Red Sea**

Rapid ocean warming due to climate change poses a serious risk to the survival of coral reefs. It is estimated that 70–90 percent of all reefs will be severely degraded by 2050, even if the Paris Climate Agreement is achieved. Warming waters tend to have larger impacts in semi-enclosed seas, where heatwaves occur more frequently. In these near land-locked bodies of water, the capacity of organisms to migrate and adapt to warming by shifting their biogeographical range polewards is limited by the presence of continental masses. The Red Sea, whose waters are channeled through the narrow Suez Canal and the Bab-el-Mandeb strait, and which is also subject to intense maritime traffic, is one of the warmest marine ecosystems on earth, with warming rates faster than global averages. This intensified warming and acidification is linked to global climate change as well as to regional stressors, such as overfishing, pollution, invasive species from global maritime traffic, and eutrophication from rapid coastal urbanization. From north to south the Red Sea registers progressively warmer waters, resembling a timeline into future oceans.[163]

159. "The Habitable Planet: A Systems Approach to Environmental Science: An interview with Jeremy Jackson," *Anneberg Learner,* https://www.learner.org/series/the-habitable-planet-a-systems-approach-to-environmental-science/biodiversity-decline/interview-with-jeremy-jackson/

160. European Commission. "The Common Fisheries Policy (CFP)" https://ec.europa.eu/fisheries/cfp_en

161. Aranda, M et al., Research for PECH Committee—EU fisheries policy—latest developments and future challenges, European Parliament, Policy Department for Structural and Cohesion Policies, Brussels (2019).

162. Michael Begon, Robert W. Howarth, and Colin R. Townsend, *Essentials of Ecology* (Hoboken, NJ: Wiley-Blackwell Publishing, 2008).

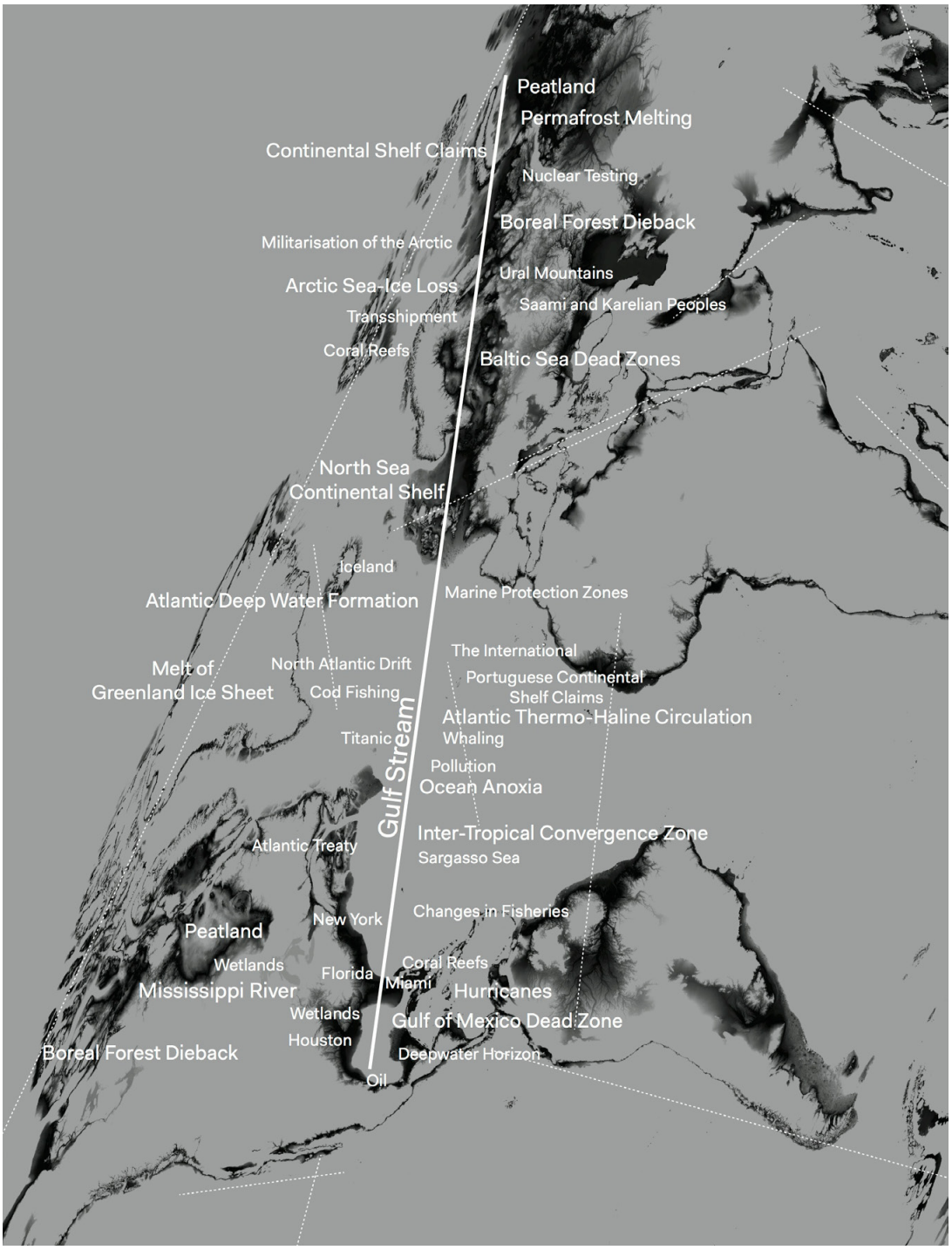
163. Karine Kleinhaus et. al, "Science, Diplomacy, and the Red Sea's Unique Coral Reef: It's Time for Action" in *Frontiers Marine Science*, February 2020. doi: 10.3389/fmars.2020.00090

While coral reefs in southern regions of the Red Sea have experienced bleaching events in the recent past, the northern sections are considered a refuge from global warming and acidification, at least for the coming decades. This resilience in the Northern regions has been registered in the Red Sea's Gulf of Aqaba, where corals display an exceptionally high bleaching threshold: the scleractinian corals here withstand water temperature anomalies that cause severe bleaching or mortality in most hard corals elsewhere. According to Mahmoud Hassan Hanafi, a marine biologist at Suez Canal University, Ismailia, Egypt, this phenomenon is likely linked with the fact that these corals evolved in an already warm body of water. Christian Voolstra, a specialist in coral reef genomics, explains that the Red Sea corals "live in a very specific symbiosis with algae that are inside the cell and they found a way to benefit each other, to have energy from photosynthesis and at the same time they live with bacteria." [164] Voolstra describes the Red Sea as a "meta-organism" where specific speciation processes lead to the development of unique molecules and metabolites that are not found in other reef systems of the word. Recent research has even identified bacteria associated with degrading crude oil compounds, suggesting the utilization of crude oil and its derivatives as a carbon source for deep-sea corals from the Red Sea. [165] Further research aims to identify these bacteria and microbial communities and understand their contribution to the unique resilience of coral organisms. These biological mechanisms and speciation processes are likely to be important for coral survival as the planet's oceans warm.

164. Christian Voolstra cited in "Scientist at Red Sea Research Center looks at the role of bacteria in 3D coral reefs ecosystems" in *Frontiers Marine Science*, February 2016 https://blog.frontiersin.org/2016/02/12/scientist-at-red-sea-research-center-looks-at-the-role-of-bacteria-in-3d-coral-reefs-ecosystems/

165. Röthig, T. et al. "Microbial community composition of deep-sea corals from the Red Sea provides insight into functional adaption to a unique environment", *Scientific Reports* 7, 2017. doi: 10.1038/srep44714

# 2. THE GULF STREAM




**Geographical areas covered**

**Gulf of Mexico; Caribbean Sea; Florida; Bermuda; New York; Maine; Newfoundland; Labrador; Mid-Atlantic Ridge; Iceland; Svalbard; Scandinavia; Barents Sea; Kola Peninsula; Novaya Zemlya; Kara Sea.**

Winds are the drivers of ocean currents in the first 100 meters of the ocean surface, yet currents also flow thousands of meters deep. The changes in the Atlantic Thermohaline Circulation is part of the large-scale ocean circulation, currently waning because of the warming of the oceans and the influx of fresh water from melting ice caps. Combined with the Atlantic Meridional Overturning (AMOC), it forms the major components of the Gulf Stream, which sustains the ecosystems of the Atlantic.

This trajectory moves with the warm waters of the Caribbean Sea toward the cold Barents Sea in the Arctic. A series of local transformations are set in motion under the impact of changes within the Gulf Stream, with fisheries being transformed, currents modified, and sea level rise rapidly endangering the dense and productive metropolitan systems of coastal America and Europe. The trajectory takes off from Gulf of Mexico which has been severely afflicted by the catastrophic oil pollution from the Deepwater Horizon accident and also comprises the world's largest apoxic dead zone. It then crosses the East Coast of the US and northern Canada and other areas affected by sea level rise; follows the transformations associated with the Greenlandic Ice Sheet, traveling all the way to the Arctic Sea, which has been transformed by extensive mineral extraction processes and increasing pollution.

Along this trajectory, the non-hierarchical qualities of the Anthropocene ocean are questioned. The superimposed datasets reveal how the vast systems of the ocean are registering transformations which interact with elements of a smaller magnitude. The feedbacks between different self-organizing forces and energies affect ecosystems and populations across the ocean.

**Caribbean Constellations**

Writing an alternative history of the Caribbean archipelago needs to depart from the unparalleled anti-imperial Haitian Revolution of the late eighteenth century and numerous other moments, before and after, when people on the islands publicly performed their aspirations for freedom against colonial enslavement and exploitation. While equally significant as the "epochal" French and American revolutions, it remains obscured and less widely discussed in imperial history. And yet, the Haitian Revolution led to a "powerful new conceptualisation of the possibilities of democratic promise, based partly on the leadership of the free black men and women and the assistance of the enslaved." [166] So powerful was the movement that it inspired abolitionist movements and the resistance to capitalist conquest on both sides of the Atlantic.

It is no doubt that the oceans play a defining role for the Caribbean islands. The sea both linked and separated the metropole from its imperial sources of wealth. Historically and presently, this dis-connection has been held together by the tenuous links of colonial interdependency and the distanced projects of domination and abandonment.

The violent convergence between harvestable environment and colonial extraction has led Caribbean writers to theorize their tropical landscape as the only surviving witness of a past that cannot be fully known and yet cannot be ignored. For Édouard Glissant, most prominently, the archipelagos of the Caribbean form a creole space of circulation and imaginary, a "world-in-relation." The Caribbean landscape, in Glissant's words, "is its own monument: its meaning can only be traced on the underside. It is all history." [167] In Beverley Ormerod's *French West Indian*, the land is "the past's only true guardian [...] history waits, latent, in Caribbean nature, which is filled with sorrowful reminders of slavery and repression."

In the eco-critical imaginary that characterizes much Caribbean literature, the wet ontologies of the ocean play a major allegorical and historical role. The poetry of Barbadian poet and historian Kamau Brathwaite springs from the Atlantic Ocean and seems to be shaped and rhythmed by the cyclical movements of the sea. Brathwaite's concept of "tidalectics," which he described as "the ripple and the two tide movement," embodies a specific rejection of the forward-directed progression of Western dialectics, based on thesis, antithesis, and synthesis.[168] The term also connotes Brathwaite's concern to move toward a sense of identity and continuity across oceans, where creolization begins, rather than an identity grounded in one place or time.[169]

While places of death and violence are often historically and geographically identifiable on land, the liquid transport systems formed by ocean currents dissolves the localization of violence and of human death,

166. Stephen G. Hall, Faithful Account of the Race: African American Historical Writing in Nineteenth-Century America, Chapel Hill: The University of North Carolina Press, 2009, 88."

167. Edouard Glissant, *Caribbean Discourse: Selected essays*, trans. by J. Michael Dash. (Charlottesville: University of Virginia Press, 1989), 11.

168. Kamau Brathwaite*, conVERSations with Nathaniel Mackey* (Rhinebeck, NY: We Press, 1999).

169. Stefanie Hessler, ed., *Tidalectics–Imagining an oceanic worldview through art and science* (Cambridge and Vienna: MIT Press and TBA21-Academy, 2018)

making specific memorial places unidentifiable.[170] Faced with the impossibility of locating the coordinates where the enslaved were thrown out of slave ships into the ocean, some Caribbean writers have understood the ocean as a cultural and material space, an unmarked graveyard for the ancestors, in which linear models of times are distorted and ruptured. Derek Walcott's poems, for example, populate the seabed with human bones, metaphorically figured in the structures of coral reefs.[171] In the words of Elizabeth DeLoughrey, "Walcott's poetics have long engaged with *living* matter as a site for more-than-human history, depicting multispecies engagements with plants, fish, corals, and other creatures of the tropical coast and sea to pose alternative narratives for history making."[172]

Not only slavery but also indenture came to be the defining feature of plantation labor, especially in the nineteenth century. The indentured migrant was an individual who had entered into an agreement to receive transportation to a colony in return for a fixed period of labor. Millions of laborers were recruited in Asia, China, Madagascar, and Africa to meet manpower needs in the colonies. This multi-ethnic history resulted in the complex social process of transculturation and creolization in the Caribbean.

Sylvia Wynter, the prodigious writer and eminent anticolonialist feminist thinker from Jamaica, spent a lifetime of creative intellectual labor arguing the many ways in which a revalorized perspective emerging from the Caribbean archipelago holds in it the possibility of undoing and unsettling Western conceptions of what it means to be human. Rearticulating "who/what we are"—for Wynter a new, yet unwritten and unlived science of being human—pays witness to the cruelties and immiseration wrought by manifold forms of violence of imperial colonialism and its underlying mono-epistemics (past and present) but more so spawns new interhuman narratives. Being human, in this context, signals not a noun but a verb. Being human is a praxis of humanness.

Wynter reads coloniality as the juridical-economic referent of racial difference, as "the order of race." The secularization of rationality and the representation of the human through Darwinism, have positioned Man in such a way as to disavow other, coexisting modes of being human. This allowed for racial difference to perform its role as an ethico-political signifier. These transformations "made possible only on the basis of the dynamics of a colonizer / colonized relation that the West was to discursively constitute and empirically institutionalize on the islands of the Caribbean and, later, on the mainlands of the Americas," she writes.[173] Hence, blackness is positioned not outside of and entering into modernity but rather as the site through which modernity and all of its unmet promises are enabled and brought to light.

170. Elizabeth DeLoughrey, "Submarine Futures of the Anthropocene," *Comparative Literature* vol. 69, no. 1 (2017): 32–44. Expanding on Elizabeth A. Povinelli's theorization of "geontologies" and drawing from Caribbean literature, DeLoughrey has utilized the term "sea ontologies" to "characterize the connection between ancestry, history, and non-Western knowledge systems in submarine aesthetics."

171. Derek Walcott, "The Schooner Flight," *Collected Poems 1948–1984* (New York: Farrar, Straus & Giroux, 1990), 349.

172. DeLoughrey, "Submarine Futures of the Anthropocene."

173. Sylvia Wynter, "Unsettling the Coloniality of Being/Power/Truth/Freedom: Towards the Human, After Man, Its Overrepresentation—An Argument," *CR: The New Centennial Review* vol. 3, no. 3 (2003): 264.

The destabilization of the modernist distinction between nature and culture, Man and human that shapes Caribbean discourse anticipates much of the current debates on the environmental crises and their consequential racial inequalities.

**Weakening Gulf Stream**

The Gulf Stream is a component of a much larger global scale ocean conveyor belt known as the Thermocline Circulation or the Meridional Overturning Circulation. Together with its northern extension the North Atlantic Drift, the Gulf Stream is a warm and swift Atlantic Ocean current that originates in the Gulf of Mexico, stretches to the tip of Florida, and follows the eastern coastlines of the United States and Newfoundland before crossing the Atlantic Ocean as the North Atlantic Current. The process of western intensification causes the Gulf Stream to be a northward accelerating current off the East Coast of North America. In the middle of the Atlantic Ocean, it splits in two, with the northern stream (the North Atlantic Drift) crossing to Northern Europe and the southern stream (the Canary Current) recirculating off the coast of West Africa.

The Gulf Stream influences the climate of the East Coast of North America from Florida to Newfoundland, and the western coast of Europe. Although it has recently been debated, there is consensus that the climate of Western and Northern Europe is warmer than it would otherwise be due to the North Atlantic Current. Its presence has led to the development of strong cyclones of all types, both within the atmosphere and within the ocean. The Gulf Stream is also a significant potential source of renewable power generation, carrying about 80 million cubic meters of water per second near Cape Hatteras in North Carolina.

Satellite data (shown in this trajectory through images taken by Sentinel-1) indicates that the Gulf Stream has been weakening since the early 1990s. Satellite models show that anthropogenic climate change induces a slowdown of Atlantic Meridional Overturning Circulation, due to more precipitation and glacial melt in Norwegian and Greenland Seas. This addition of freshwater makes the surface water less dense, which makes it less prone to sinking into the deep ocean. A slowdown of the Gulf Stream and the North Atlantic Current could lead to drastic drop in temperature in Northwest Europe.

In the US, sea level is rising off the Northeastern and Mid-Atlantic states, and part of it is driven by the weakening of the Gulf Stream. The coastal flood caused by sea level rise could render the impact of hurricanes greater. Climate change is likely to produce stronger winds that will push seawater up against the coast, creating more intense hurricanes.[174] Higher sea level, potentially caused by the weakening Gulf Stream, only adds to the potential catastrophic convergence of anthropogenic climate change.

174. Arnold Gordon, "How Will Climate Change Impact the Gulf Stream?" State of the Planet blog, the Earth Institute, Columbia University (January 2, 2020), https://blogs.ei.columbia.edu/2020/01/02/climate-change-gulf-stream/.

**Marine Protected Areas**

Marine Protected Areas (MPAs) are established to restrict or ban human activity in the seas, oceans, and estuaries for conservation and research purposes. Their implementation comes in a variety of forms and may be managed at a territorial, regional, national, or international level while their restrictions may also vary according to their purposes. When financed, administered, and properly enforced, they provide an effective conservation strategy for biodiversity and habitat protection. However, they may also become "paper parks" – i.e. only existing on maps and for legislative purposes, but with little effect on the marine ecologies they claim to protect. In efforts to overcome such conditions of ineffectiveness, activists, scientists, and organizations around the world are working towards the enforcement and enlargements of MPAs.

Founded by Francesca Thyssen-Bornemisza and Markus Reymann, the Alligator Head Foundation (AHF) is a non-profit organization based on Portland, Jamaica. Through a formal agreement with The Ministry of Industry, Commerce, Agriculture and Fisheries, the AHF manages the East Portland Special Fishery Conservation Area (also called the East Portland Fish Sanctuary), an area that has been legally recognized in 2016 under the Jamaican Fishing Industry Act. The fish sanctuary spans six square kilometers of coastal waters and comprises critically and ecologically sensitive coral reefs, mangroves, seagrass beds, and deep-water habitats. The EPSFCA harbors an array of reef fish, birds, reptiles, and invertebrate species, including the endangered loggerhead and hawksbill sea turtles, and several thriving colonies of elkhorn and staghorn coral, which are listed as critically endangered species. The AHF is one of few marine sanctuaries worldwide that has its own marine research facility closely linked with management. The research program takes an ecosystem-based approach, and focusses on interconnectivity between land and sea, habitat restoration, invasive species control, and ecological and environmental monitoring.

Along its itinerary across the North Atlantic, the trajectory also traverses the MPAs that have been established by the Convention for the Protection of the Marine Environment of the North-East Atlantic (or OSPAR Convention), which stands as the current legislative body regulating international cooperation on environmental protection in the North-East Atlantic. Following a period of preparatory work, the 2003 OSPAR Ministerial Meeting in Bremen adopted "Recommendation 2003/3" on a network of marine protected areas with the purpose of establishing an ecologically coherent network of MPAs in the North-East Atlantic. OSPAR's latest status report states that "since 2016, 48 MPAs with a surface area of more than 57,000 $km^2$ were added to the OSPAR Network of MPAs", a promising result.[175] The report also specifies that "to date, the majority of designated OSPAR MPAs are located in territorial waters, with an overall coverage of 19.6 %. The area beyond the limits of national Exclusive Economic Zones (EEZ) [...] include 8.9 % by sea areas designated within OSPAR MPAs, whilst the areas that are the most affected by anthropogenic activities, the EEZs, find the lowest coverage of OSPAR MPAs, where 2.7 % is designated

175. OSPAR Commission, "2018 Status Report on the OSPAR Network of Marine Protected Areas". https://www.ospar.org/documents?v=40944

within OSPAR MPAs."[176] However, despite the significant progress that has been made in developing OSPAR's network of MPAs, the report states that all zones "cannot be considered to be ecologically coherent" according to specific spatial analysis tests.[177] As its future work will focus on reaching such ecological standards, the organization remains nonetheless a vital agent for the continuous work that is demanded by the enforcement and maintenance of MPAs.

The use and promotion of land or marine protected areas are criticized by some as a means to implicitly offset and sustain the wider capitalist social relations that have also correlated the devastation of biodiversity. The growth in territorial assertions to protect nature by separating it from some human activity has tracked the expansion of neoliberal markets worldwide. Global conservation governance is increasingly turning to look in the blind spot of protected area orthodoxies, writes Louise Carver. It is beginning, for example, to conceptualize that the not only the direct but also the *indirect* drivers for the ruination of nature in general arise from beyond of the fences erected for enclosure, exclusion and protection. Others suggest it is the separatist imaginary itself integral to modern epistemologies. This much is also true of the managerial and historically reductive ideology which shapes the episteme of contemporary conservation norms. Decades of scholarship and centuries of indigenous resistance to land enclosure and appropriation has foregrounded the violence of colonial, capitalist and extractive orientation to nature that is framed foremost as resource for these purposes.

**Gulf of Mexico**

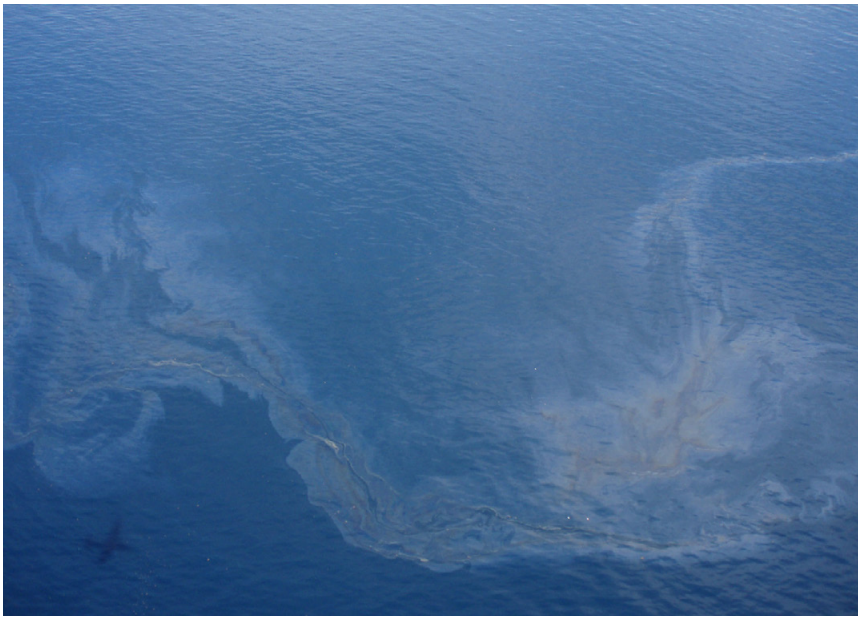
In order to comprehend the Gulf of Mexico dead zone it is necessary to first consider the Mississippi river and its vast watershed. Before emptying its fresh waters into the Gulf of Mexico, the Mississippi river, which takes its name from the French colonial rendering of the indigenous Anishinaabe term *misi-ziibi* (Great river), traverses multiple sites of the US that are deeply transformed by anthropogenic activities. From its historic role as a transportation network of human forced labor and industrial commodities to its heavy dredging in the 20th century, the Mississippi river has been continuously shaped by human-induced environmental transformations. It is an Anthropocene river[178] and undoubtedly a Capitalocene one. Various "chemical corridors" along its length continue to burden local populations with cancer incidence rates sometimes up to 800 percent the national average. The river transports the residues of the logging and mining activities in its Upper River area, the intensive agriculture in the Mid-West and the petrochemical centers from St Louis to Louisiana. Heavily and increasingly precariously engineered, the Mississippi has been transformed and is maintained as a channelized water highway designed to carry increasing scales and speeds of barge traffic and perform as a primary commodity gateway

176. The Commission also protects several additional regions: the Greater North Sea has a MPA of 18.6%, Celtic Seas and Wider Atlantic have 15.3% and 8.3 % area designated within OSPAR MPAs, respectively. While coverage of the Bay of Biscay and Iberian Coast (Region IV) is at 5.9 %, the Arctic Waters (Region I) show the lowest coverage with 1.9 % designated within OSPAR MPAs.

177. OSPAR Commission. "2018 Status Report on the OSPAR Network of Marine Protected Areas". https://www.ospar.org/documents?v=40944

178. See "Mississippi. An Anthropocene River" project by Haus der Kulturen der Welt. https://www.anthropocene-curriculum.org/project/mississippi/

to and from the Atlantic Ocean via the Gulf of Mexico. The Mississippi River is also a mythic, revered, and en-spirited being for which many are fighting for—convening weekly to sing healing ceremonies along the length of her banks and living in symbolic interconnection to.



→Detail from aerial photograph of the Gulf of Mexico, approximately 3 miles from Deepwater Horizon Well, 'Oil Sheen'. Photo: CaliforniaDFW, Under CC BY 2.0

When discharging its fresh waters at an annual average rate of 6,000 to 20,000 cubic meters per second into the Gulf of Mexico, the Mississippi river also delivers vast quantities of dissolved nitrogen and phosphorous molecules, accumulated throughout its meandering path down five states of the US. Dramatically upending the chemical loads that eco-systemic processes can ordinarily absorb and metabolize; the anthropogenically increased inputs of agricultural nutrients combine with soil erosion, animal and industrial waste, sewage, and increased heavy rain falls to enter the ecology of the Mississippi .[179] The overload of nutrients are eventually delivered into the Gulf of Mexico, stimulating the excessive growth and then death of bacteria and algae that subsequently sink and decompose at the bottom of the basin. Through providing most of their dissolved oxygen to this process the now hypoxic waters support fewer organisms, and when water bodies experience such conditions over long periods of time they are referred to as "dead zones." In these zones, immobile life forms suffocate, whereas fish, for instance, either leave the area or experience sublethal effects. The Gulf of Mexico dead zone is one of the largest reported dead zones, along with the quasi enclosed seas of the Baltic, the Adriatic and the Red Sea. The size of dead zones shifts seasonally and may be affected by heavier rainfalls. In 2017, the Gulf of Mexico dead zone reached a record-breaking size of 8,776 square miles.[180]

Just as the ecology of the basin is in part affected by these non-local events coming from activities occurring across the US, the consequences brought by the dead zone also reverberate beyond the Gulf of Mexico along with effects that circle back to US fishing economy. NOAA reports that the

179. Monica Bruckner, "The Gulf of Mexico Dead Zone", Microbial Life. https://serc.carleton.edu/microbelife/topics/deadzone/index.html

180. NOAA. "NOAA forecasts very large dead zone for the Gulf of Mexico". 2019 https://www.noaa.gov/media-release/noaa-forecasts-very-large-dead-zone-for-gulf-of-mexico

Gulf of Mexico supports a total of 20 billion dollars revenue from US commercial and recreational industries.[181] Home to what remains of the Fertile Fishery Crescent, a large biomass of fish and crustacean, the Gulf of Mexico hosts highly prized species of fish, such as the Menhaden fish, that are an essential source of fertilizer, fish oil and fish meal.

In the trajectory, the dead zone is illustrated via processed information taken from the NOAA Shoreline database, which contains extensive research in the Gulf of Mexico. NOAA issues a dead zone forecast each year, and refines the models offsite link used by the Hypoxia Task Force to set nutrient reduction targets and better understand the link between hypoxia and nutrients. The forecast assumes typical coastal weather conditions, but the measured dead zone size could be disrupted and its size could change by major wind events, hurricanes and tropical storms which mix ocean waters, as occurred in 2018.

**BP Deepwater Horizon**

"(Oil) is registered in the absence of its name from any international negotiation document on climate change, it is marked in the growing influence of oil companies on the global financial markets, it is registered in the direct access to policy makers, it is in the missing and banned photographs of the impact of the BP Deepwater Horizon disaster in the Gulf of Mexico, and its traces are increasingly linked to the research on its consequences." —Territorial Agency, *The Museum of Oil* (2015)


→ BP Deepwater Horizon Rig, April 22, 2010. Made available anonymously to Anne McClintock on July 14, 2010

On April 20, 2010, the Deepwater Horizon mobile drilling unit exploded, caught fire, and eventually sank, resulting in a massive release of oil and other substances from BP's well in Macondo. The event sent oil spewing into the Gulf of Mexico for eighty-seven days, becoming one of the worst environmental disasters in US history. By the time the leaking

181. NOAA "US Gulf of Mexico Marine Ecosystem". https://videos.fisheries.noaa.gov/detail/videos/science-technology/video/4306205816001/u.s.-gulf-of-mexico-marine-ecosystem?autoStart=true&page=1

exploratory well was finally capped on July 15, 2010, the oil had already caused permanent damage to the marine biology of the Gulf, destroying coastal wildlife, polluting habitats, and ruining fishing communities. The amount of live oil released during the event varies from one report to another, but latest estimates claim that 210 million gallons of live oil leaked into the Gulf of Mexico with oil slicks covering an estimated area of 149,000 square kilometers.[182]

Subsea videos captured dramatic images of oil spewing unchecked from the well's broken riser pipe into the deep ocean. Oil moved with deep-sea currents, creating a plume of oil in the water; oil and associated marine oil snow (the flakey sedimentation of falling organic matter) also settled on the sea floor. Currents, winds, and tides carried these surface oil slicks to the Gulf states, fouling more than 2,100 kilometers of shoreline, including beaches, bays, estuaries, and marshes from eastern Texas to the Florida Panhandle. In addition, some lighter oil compounds evaporated from the slicks, exposing air-breathing organisms like marine mammals and sea turtles to noxious fumes at the sea surface, as reported by the NOAA Gulf Spill Restoration project.

The event was subject to diverse image-making, mainly split into two types of media geographies: satellite images tracking the spill's expansion across the Gulf and the real-time underwater cameras that streamed images of the spouting crude oil. While satellite images primarily appeared in scientific contexts and government reports, new studies based on in-situ observations, three-dimensional modeling, and tests for oil concentration ranges in marine organisms have shown that satellite images were unable to detect the full extent of pollution in the Gulf. The study showed that the effects of the spill were 30 percent more widespread than initially thought, claiming "that large areas of the Gulf of Mexico were exposed to invisible and toxic oil that extended beyond the boundaries of the satellite footprint and the fishery closures."[183]

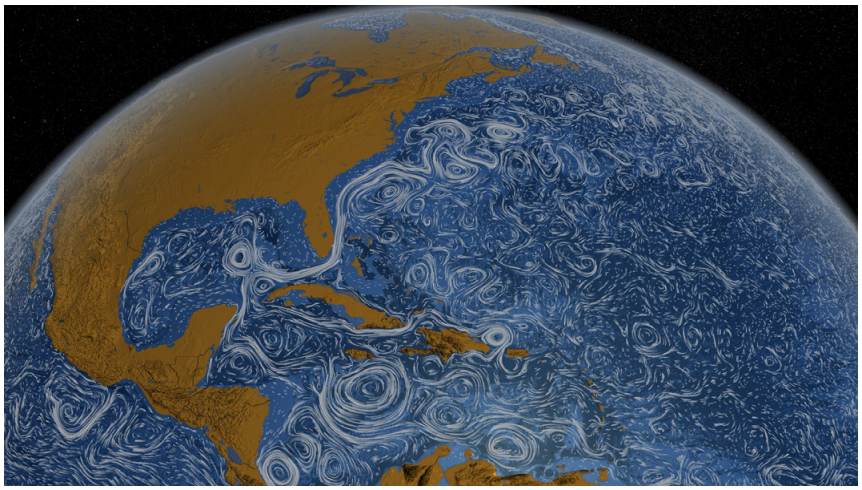

→ BP Deepwater Horizon Rig, April 22, 2010. Made available anonymously to Anne McClintock on July 14, 2010

182. Igal Berenshtein et al., "Invisible oil beyond the Deepwater Horizon satellite footprint." *Science Advances* vol. 6, no. 7 (February 2020).

183. Berenshtein et. al, "Invisible oil beyond the Deepwater Horizon satellite footprint."

Other angles of investigations in the visualization of the event have also positioned ecological sites as witnesses. In her investigative work *Nature Represents Itself*, spatial researcher and artist Susan Schuppli, uses a combination of aerial, underwater, and satellite imagery of the event, as well as CGI simulation to argue that the swirling oil slick from the Deepwater Horizon spill amounted to a kind of camera-less photography, a chemical reaction caused by hydrocarbon atoms interacting with water and sunlight. Schuppli writes: "When the smooth viscosity of oil comes into contact with the rough surface tension of the sea [...] rapid transformations in the thickness of the oil film occur and therefore also extraordinary and rapid shifts in colour. The cinematic capacity of the oil spill isn't simply a consequence of its representational condition as a mirrored watery surface that is capable of projecting an aesthetic event back at us [...] but is a feature of its very ontology—its molecular structure and behaviour. While analogous to the workings of the cinematic apparatus, the oil spill is perhaps better understood as engaged in the production of a new form of cinema organised by the found footage of 'nature' itself."[184]

In November 2010, a lawsuit undersigned by various environmental activists such as Vandana Shiva, was filed against British Petroleum on behalf of the rights of nature and under the principle of Universal Jurisdiction. After denouncing the bias of the international system of rights towards protecting the interests of transnational corporations and their predatory use of property and exposing the facts that led to and resulted from the Deepwater Horizon disaster, the lawsuit listed a series of legal arguments based on the Ecuadorian Constitution of 2008 and demanded BP to make public all the information in its possession on the Deepwater Horizon disaster and to abstain from continuing deep-water oil exploration, in particular in the Macondo field. Despite the results obtained from such efforts, British Petroleum still holds shares on several oil drilling operations in the Gulf of Mexico. Most recently, in 2019 the Trump administration eased regulations adopted after the Deepwater Horizon disaster in order to expand drilling off the US Coast and the Gulf of Mexico.[185]



→ Surface currents of the Gulfstream, from data spanning June 2005 to December 2007. Still from NASA's 'Perpetual Ocean' visualization of surface currents. From NASA Goddard Space Flight Center Scientific Visualization Studio. This image was marked with a CC BY 2.0 license

184. Susan Schuppli, "Slick Images: the photogenic politics of oil," *Allegory of the Cave Painting*, eds. Mihnea Mircan and Vincent W. J. van Gerven Oei (Milan: Mousse, 2015).

185. Associated Press, "Trump eases regulations adopted after BP Deepwater Horizon disaster," *The Guardian* (May 2, 2019), https://www.theguardian.com/environment/2019/may/02/trump-eases-regulations-adopted-after-bp-deepwater-horizon-disaster.

**Cod Overfishing and the Cod Wars**

Also known in Iceland as "the wars for territorial waters", the Cod Wars were a series of three undeclared wars fought between Iceland and the United Kingdom from 1952 to 1976. Prior to these conflicts, British fishermen had been increasingly extending their fishing activities in Iceland's territorial waters in order to supply a high national demand for cod. The labor aboard the 24/7 operating trawlers was took place under life threatening conditions imposed by the glacial weather of Northern Iceland, as reported by a former fisherman from Lancashire in north west England.[186] These voracious overfishing events strongly impacted the economy of Iceland, which primarily relied on fishing. Shortly after the first Convention on the Law of the Sea held in Geneva in 1958, Iceland decided to expand its territorial waters from 3 to 12 nautical miles. Britain, in total disregard of Iceland's new legislation, continued its fishing activities which were followed by tensions with the Icelandic gunboats in the newly demarcated nautical zone. The tensions between the British Royal Navy and Iceland's Coast guard was dubbed as the first "Cod War", which ended with an agreement that granted British fishermen the right to fish in proximity to Iceland's territorial waters during a strictly limited time of the year.

A little more than a decade later, Iceland's fisheries were reported to be on the verge of depletion, despite the embargo imposed on the UK. History seemed to repeat itself and the newly established government of Iceland proceeded by claiming an extension of its territorial waters to a total of 50 nautical miles. As with the first Cod War, the newly claimed territory caused frictions amongst the two parties, along with raising concerns with other interested states, namely Germany and Denmark. After threatening to leave NATO, Iceland gained leverage over the northern European states who, to avoid jeopardizing the alliance and therefore hinder their relationships with the US, retreated their trawlers for a period of two years thus putting an end to the second Cod War. After the expiration of the accord, Britain persistently sent its trawlers back to Icelandic territorial waters, under the principle of the "freedom of the seas" and presumed historical rights to fish in Icelandic waters – two principles to which all British governments remained faithful throughout the Cod Wars.[187] Unsurprisingly, the decision brought additional hostility at sea. Iceland responded by expanding its territorial waters to a zone spanning 200 nautical miles, corresponding to today's internationally accepted EEZ. The tensions that arose from the third Cod War also led Iceland to temporarily break international relations with the UK, who, after receiving pressure by the US, finally retrieved its trawlers and acknowledged Iceland's EEZ.

The depletion of fish stocks is not a modern problem — for centuries fisherman have been extending their quest for fish to satisfy demand, beginning with Roman empires going as far as the Atlantic coasts of Spain and France to find new fisheries. However, the realization that the oceans are not a bountiful and inexhaustible resource, as believed by maritime powers throughout history, came as a shocking realization in the 20th century when fisheries began to collapse. The Cod Wars are emblematic of this crisis and

186. Luke Brown, "Cod wars to food banks: how a Lancashire fishing town is hanging on", *The Guardian*, February 2020. https://www.theguardian.com/society/2020/feb/21/cod-wars-to-food-banks-how-fleetwood-lancashire-fishing-town-is-hanging-on

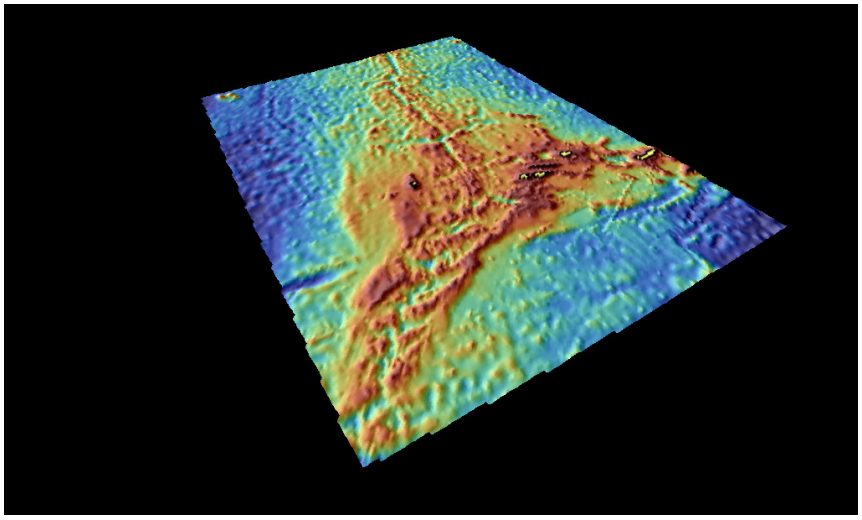
187. GuÐmundur J. GuÐmundsson "The Cod and the Cold War" (Scandinavian Journal of History, 31:2, 2016), 97-118. DOI: 10.1080/03468750600604184

the historical repetitiveness that has characterized these events indicates the strong socioeconomic reliance on maritime resources. The embargos that arose from the Cod Wars had tragic economic consequences in the UK, causing thirty thousand fishermen and fish plant workers to lose their jobs.[188]

The concept and expansion of EEZs, which accompanied and was symptomatic to these events, came with the realization that fishing technology had increased at a much greater speed than the understanding of the oceans' ecologies.

**Portuguese Continental Shelf Claims**

Amounting to a total of 1,727,408 square kilometers—nearly eighteen times the size of the country's territory—Portugal's current EEZ is the fifth largest in Europe. It is composed of the country's continental shelf (327,667 square kilometers), the Azores islands' EEZ (953,633 square kilometers), and the Madeira islands' EEZ (446,108 square kilometers). In May 2009 Portugal submitted a claim to extend its jurisdiction over additional 2.15 million square kilometers of the neighboring continental shelf resulting in a marine territory of more than 3.8 million square kilometers.



→ Bathymetry of the Azores triple junction, a point along the Mid-Atlantic Ridge where the North American, Eurasian and African plates meet and hydrothermal activity leads to the precipitation of valuable minerals. Author: Pim van Tend. Imagery from NOAA, ETOPO1, GPLATES.

Several hydrothermal vents and seamounts located to the southwest of the Azores archipelago have been of interest to a number of public and private actors for future deep-sea mining in Atlantic waters. Until recently, the European Union has been at the center of the growing public-private mobilization, where national maritime concessions around the Azores assume a prominent role. According to Marta Chantal Ribeiro, coordinator of the Law of the Sea Research Team at the Interdisciplinary Centre for Marine and Environmental Research (CIIMAR, Oporto University), the sea around the Azores "will be the most appealing area in the context of the European Union and the one where mining is likely to be able to advance, from the point of view of the economic interest of the deposits there."[189]

188. Jeremy B. C. Jackson, "Revaluing the oceans", *Oceans in Transformation*, eds. Territorial Agency and Daniela Zyman (forthcoming, 2020).

189. Cit. in: Margarida Mendes and João Martins, "Turvar as Águas, Parte II," *Mapa* vol. 15 (January 2018), https://www.jornalmapa.pt/2018/01/15/turvar-as-aguas-parte-ii/.

Around 2009, the Canadian deep-sea extraction company, Nautilus Inc. submitted the first of many requests for prospecting activities in six locations of the Azores Sea. Deeply involved in the Solwara 1 project in Papua New Guinea, the first massive sulfide mining operation to receive a mining license, Nautilus is regarded as a notorious engineering and environmental policy pioneer, aggressively pushing the deep-water limits of extraction. Given the extent of disturbances resulting from deep-sea mining operations and the extended recovery times, Nautilus's prospecting activities are plagued by massive resistance at all level and financial setbacks.

In July 2017, the European Union, Brazil, and South Africa signed the Belém Statement, an agreement that reinforces the commitment to develop research and innovation in the Atlantic Ocean. The agreement was launched during a conference titled "A New Era of Blue Enlightenment" and held in Belém, Portugal; it promoted the Azores as a geostrategic point for Atlantic science, but also as a source of mineral resources to be exploited. This tension between preservation for the sake of scientific exploration and extractivist ambitions characterizes much of the discourse around the management of the Azores's maritime environment. "A model for marine conservation for island states,"[190] it was among the first marine environments to have seen the integration of Marine Protected Areas, which resulted in the establishment of several safeguarded sites.

With operations in PNG scheduled to start in 2017 and postponed on several occasions, Nautilus's bankruptcy, which was filed in November 2019 and left PNG with a heavy financial burden, caused the mining industry and governments to take stakes of their operations. Subsequent calls for a ten-year moratorium on mining voiced by many environmental NGOs and the Pacific island states of Fiji and Vanuatu were recently joined by the European Parliament.

In 2021, a new "Mining Code" that regulates seabed mining in international waters is expected to be adopted by the 167 member countries of the International Seabed Authority. This legal code will contain a comprehensive set of rules, regulations, and procedures controlling the exploration and exploitation of marine minerals, deemed to be "the common heritage of humankind." Once issued and approved, commercial deep-sea mining activities could proceed from prospecting to exploitation activities on the seabed.

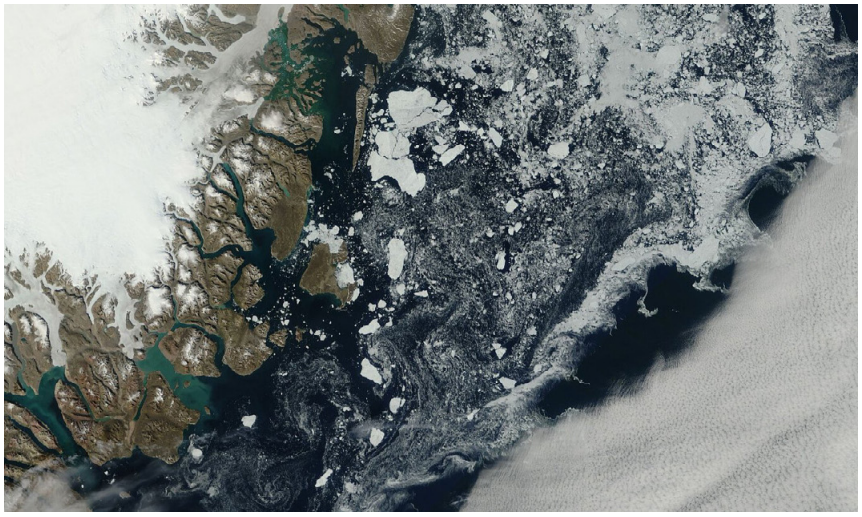
**Melting Greenland Ice Sheet and Inuit People**

The melting of the Greenland Ice Sheet has been a significant contributor to global sea level rise in the past decades, and it is expected to continue to be so in the future. Increases in glacier flow and surface melting have been driven by oceanic and atmospheric warming. Although the ice sheet was close to a state of balance in the 1990s, annual losses have risen since then, peaking at 335 billion tons per year

190. Rita C. Abecasis et al., "Marine Conservation in the Azores: Evaluating Marine Protected Area Development in a Remote Island Context," *Frontiers in Marine Science* vol. 2 (December 2015).

in 2011. Greenland lost 3,800 billion tons of ice between 1992 and 2018.[191] While changes in climate as such may not be unusual in the Arctic region, current trends have shown dynamics and intensities unprecedented in local memory.[192]

The melting ice sheet is primarily affecting the livelihood and culture of the indigenous Inuit and First Nations communities inhabiting the Arctic regions of Greenland, Canada, and Alaska. As in other cases of racial climate injustices that have made indigenous communities around the globe the first victims of the Anthropocene, the disruption of local "naturecultures" begins with colonial occupation. Prior to the arrival of European settlers in the seventeenth and eighteenth centuries, Inuit indigenous groups adapted to local environmental conditions by several means: knowledge of the environment and skills in a broad variety of subsistence techniques, diversity of and flexibility in resource use, high group mobility, mutually supportive social networks, and shamanistic practices that mediated between people and the spirit world.[193] With conversion to Christianity and the move to sedentary settlements in the nineteenth and twentieth centuries, Arctic indigenous peoples experienced drastic changes in the conditions of their communities. In the 1950s Inuit people in several locations in the Arctic were subject to government relocation—one of several strategies used by colonial occupying forces in the Arctic that either relocated Inuit people in order to annex strategic sites or forced them into exile to occupy contested territory.[194]



→ Sea ice swirls in ocean currents off the east coast of Greenland on Aug. 17, 2012, as seen by the MODIS instrument on board the Terra satellite. Greenland's ice sheet and outlet glaciers can also be seen at left. Photo: NASA Goddard Space Flight Center

191. The IMBIE Team, "Mass balance of the Greenland Ice Sheet from 1992 to 2018," Nature issue 579 (December 2019), https://doi.org/ 10.1038/s41586-019-1855-2.

192. Takashi Yamanouchi, "Arctic change in the flow of Global Warming: Need for long-term monitoring observations," *Climate change and Arctic sustainable development: Scientific, social, cultural and educational challenges* (Paris: UNESCO, 2009), 53–60.

193. Asen Balikci, "The Netsilik Eskimos: adaptive processes," *Man the Hunter*, ed. in Richard Borshay Lee and Irven Devore (Chicago: Aldine De Gruyter, 1999), 78-82. See also Fikret berkes and Dyanna Jolly, "Adapting to climate change: social-ecological resilience in a Canadian western Arctic community," *Conservation Ecology* vol. 5 (2002).

194. See Melanie McGrath, *The Long Exile: A Tale of Inuit Betrayal and Survival in the High Arctic* (London: Fourth Estate, 2006) and the documentary *Exile* by Zacharias Kunuk, Isuma Productions, 2008.

However, despite centuries of displacement and cultural disruption, the Greenlandic Inuit communities have now developed hybrid conceptualizations of the changing environment, which draw on their traditional knowledge but also from current political debates over the political future of Greenland along with their personal experiences with sustainable development programs.[195] Their knowledges have been recognized in Greenlandic political discourse around climate change. At the 2015 United Nations Climate Change Conference, Vittus Qujaukitsoq, then Minister for Finance, Mineral Resources and Foreign Affairs of the Greenland government, underlined the importance of incorporating the knowledge and experience of the Inuit people to gain an understanding of climatic changes: "For the past 4500 years Greenland has been the land of the Inuit, and my people understand and belong to this land. It is important to listen to the people with the most experience and knowhow to survive in the Arctic, which is the region which experiences the most significant and rapid climate change, in order to learn from our experiences and observations. Only in this manner, can we achieve an overall understanding of the severe impacts of current climate changes on our planet."[196]

**Greenlandic Independence**

In 2009, Greenland officially became a self-governing territory of the Kingdom of Denmark, with more than 75 percent of those eligible to vote choosing in favor of self-government. It grants Greenlanders the legal right to proclaim independence, but the implications of such a decision are uncertain. The secession from Denmark entails a loss of Danish subsidies, that will have to be compensated with an increase in autonomous revenues.

Coinciding with Greenland's self-government arrangement, the world's attention turned to the Arctic due to climate heating and to speculative developments.[197] In addition to foreign interests in Greenland's geopolitical position, the melting of Greenland's vast icy expanses is revealing and rendering accessible the island's large reserves of rare-earth elements and minerals such as iron, gold, uranium, and copper. Given these conditions, Greenland's efforts to reach full economic independence from Denmark entails decisions to establish large-scale extractive industries in its territory to develop ties with foreign investment.[198] The mounting international interest in Arctic resources will be served by the creation of a sovereign government in Greenland that would have international agency and a considerable impact on social relations on the island.

195. Cunera Buijs, "Inuit perceptions of climate change in East Greenland," *Inuit Studies* vol. 34 no. 1 (January 2010).
https://www.erudit.org/fr/revues/etudinuit/2010-v34-n1-etudinuit3992/045400ar/

196. "Speech by Minister for Finance, Mineral Resources and Foreign Affairs Mr. Vittus Qujaukitsoq," Paris, December 7, 2015

197. The Arctic region is suspected to be the largest unexplored reserves of oil, gas, minerals, and metals in the world. As climate change creates new sea lands, one of the less explored regions is becoming more accessible for exploitation.

198. Árni Snævarr. "Between a Rock and a Hard Place: Greenland´s Aspirations for Independence in Times of Climate Change" (October 2017), https://hr.un.org/sites/hr.un.org/files/editors/u439/Greenland%20Aspirations%20for%20Independence%20in%20Times%20of%20Climate%20Change.pdf. https://hr.un.org/sites/hr.un.org/files/editors/u439/Greenland%20Aspirations%20for%20Independence%20in%20Times%20of%20Climate%20Change.pdf

The potential and foreseeable opening of Arctic waters has drawn international attention to the Arctic region, rich in minerals and other resources. The pressure on the North and from the North—via a process called devolution, i.e. the transfer of government power, authority, and resources from the national government to sub-national, indigenous-led governments—has intensified over the past twenty years. The receding of ice has catapulted the Arctic to the forefront of national and international policy debates. But what happens when the sea level rises in unpredictable ways, when impenetrable ice passages open over the next years and decades, and when inaccessible resources become available for exploitation?

**Geopolitics of Arctic Melt**

In recent years, the Arctic region has become the object of an intensified capitalist re-valorization. No longer portrayed as an untamable wilderness, the region is now presented as a territory for exploit, full of enormous, untapped resources. The accelerated melting of the Arctic ice has created the opportunity and environmental conditions which would allow access to the "new frontier" of capital accumulation. A permanently navigable Northwest Passage (through North America) or Northern Sea Route (over Eurasia) would significantly shorten existing shipping routes and circumnavigate the chokepoints of the Strait of Hormuz, the Gulf of Aden, or the Strait of Malacca. According to some estimates, "these shortcuts could cut the cost of a single voyage by a large container ship by as much as 20 per cent – from approximately $ 17.5 million to $ 14 million – saving the shipping industry billions of dollars a year."[199]

The prospect of an ice-free passage has made the questions of legal status particularly relevant. Canada considers the Northwest Passage to be part of its internal waters, whereas most maritime nations, including the United States, consider them to be an international strait, which allows the right of passage. Russia considers portions of the Northern Sea Route east of Novaya Zemlya to the Bering Strait within its Arctic EEZ, meaning ships will pass through Russian territorial and internal waters.

In 2007 a Russian flag was planted on the Arctic seabed below the North Pole, directly on the 1500-kilometers-long Lomonosov Ridge which divides the Arctic Ocean into the Eurasian and Amerasian basins. Triggering an international outcry, the Russian tricolor became a symbol for what has been labelled the "Geopolitics of Arctic Melt." This concept frames the new geopolitical interest in the region, which changed "from one of primarily scientific and environmental concerns into a maelstrom of competing commercial, national security and environmental concerns."[200]

199. John Vidal, "Arctic ice shrinks 18% against record, sounding climate change alarm bells", *The Guardian* (September 19, 2012), http://www.guardian.co.uk/environment/2012/sep/19/arctic-ice-shrinks. See also Scott G. Borgerson, "Arctic Meltdown: The Economic and Security Implications of Global Warming," *Foreign Affairs* vol. 87, no.2 (April 2008): 63–77.

200. Charles K. Ebinger and Evie Zambetakis, "The Geopolitics of Arctic Melt," *International Affairs* vol. 85, no.6, (October 2009): 1215–1232, 1215.

Until 1999, the geographic North Pole and the major part of the Arctic Ocean had generally been considered an international space, including both the waters and the sea bottom. However, the United Nations Convention on the Law of the Sea (UNCLOS) has prompted Denmark (2014), Russia (2001) and Canada (2019) to submit competing claims or to reinforce preexisting claims to portions of the seabed of the polar region. The UN's Commission on the Limits of the Continental Shelf is empowered to assess whether areas of the seabed meet a series of bathymetric and geological criteria which can permit coastal states to claim exclusive rights to the non-living resources of the seabed, beyond 200 nautical miles from coastal baselines. According to international law expert Michael Byers, each of these nations is scientifically correct when it asserts that its continental shelf extends beyond the North Pole. "All three countries' scientists take the view that it is the same continental shelf all the way around the ocean, because North America used to be part of the same continent as Eurasia," he explains.[201]

→ Spirals of melting ice, Greenland. Photo: Anne McClintock, July 19, 2012.

Along the new Artic frontier, the race for control over resources—minerals, including gold, diamonds, and rare-earth metals, as well as petroleum, natural gas, and fish—and access to the new shipping lanes has intensified. Russia and Norway have been the most active Arctic nations, investing in natural gas and oil infrastructure, deep-water ports, and ships capable of navigating the Arctic Ocean's waters. Two million Russians live in the country's largest Arctic cities Murmansk and Norilsk. China is backing Russian gas projects, offering development loans to other Arctic nations, and building a fleet of icebreakers. In a 2018 white paper, China outlined its main strategic interest in building a "Polar Silk Road," connecting Asia, North America, and Europe.[202]

201. Tom Metcalfe, "Canada Makes a Claim to the North Pole," Live Science (June 7, 2019), https://www.livescience.com/65659-canada-claims-north-pole.html.

202. See Chih Yuan Woon, "Framing the 'Polar Silk Road' (**冰上丝绸之路**): Critical Geopolitics, Chinese Scholars and the (Re)Positionings of China's Arctic Interests," *Political Geography* vol. 78 (April 2020): 102–141, https://doi.org/10.1016/j.polgeo.2019.102141.

→ The Great Melt of Greenland. Photo: Anne McClintock, July 19, 2012.

The Arctic territory is dotted by numerous military bases, airfields, refueling stations, and a NATO station. In April 2017, the Russian Government announced that it had completed a new military base on the archipelago Franz Josef Land and the restoration of several, previously abandoned bases in the Arctic.[203] Four other Arctic military bases—at Rogachevo, Cape Schmidt, Wrangel Island, and the Sredny Peninsula—as well as a military airstrip, called Nagurskoye, are, among other military facilities, also under construction. This massive build-up is thought to be intended to strengthen control of international shipping on the Northern Sea Route, protecting Russian oil and gas resources in the Arctic, but also as defense infrastructure in what has been described as a possible "new cold war."

On the peninsula of Cape York in Greenland is the colonial outpost of the United States' Thule Air Force Base, which serves the US (and NATO) as a logistical hub and communications node for Arctic mobilization and surveillance. Established in 1951, Thule became a key station in the Distant Early Warning Line, the electromagnetic curtain extending across the Western ice cap designed to alert mainland USA of incoming USSR bombers carrying nuclear warheads. Today, Thule Air Base plays host to a variety of operations, including those concerned with ballistic missile early warning and defense, satellite control and tracking facilities (including one of the most powerful Raytheon's giant AN/FPS-120 Solid State Phased Array Radar), the air base, and the seaport which is only accessible for a short period during the summer.

**Novaya Zemlya Soviet Nuclear Testing**

Novaya Zemlya ("New Land") is a mountainous archipelago on the Russian Arctic coast. It is Europe's most extreme northeastern land. Novaya Zemlya is composed of two main islands, the northern Severny Island and the southern Yuzhny Island, which are separated by the Matochkin Strait.

203. See "Russia's new Arctic Trefoil military base unveiled with virtual tour" on the BBC website (April 18, 2017), https://www.bbc.com/news/world-europe-39629819.

At the beginning of the Cold War, the Soviet Union designated Novaya Zemlya as a nuclear test site divided in three zones spread across the islands. According to the Oklahoma Geological Survey Observatory's "Catalog of Nuclear Explosions" and "Nuclear Explosions, 1945–1998," published by the Stockholm International Peace Research Institute (SIPRI) and Sweden's Defence Research Establishment, Novaya Zemlya hosted 224 nuclear detonations over its history as a nuclear test site (eighty-eight in the atmosphere, three underwater and thirty-nine underground).[204]

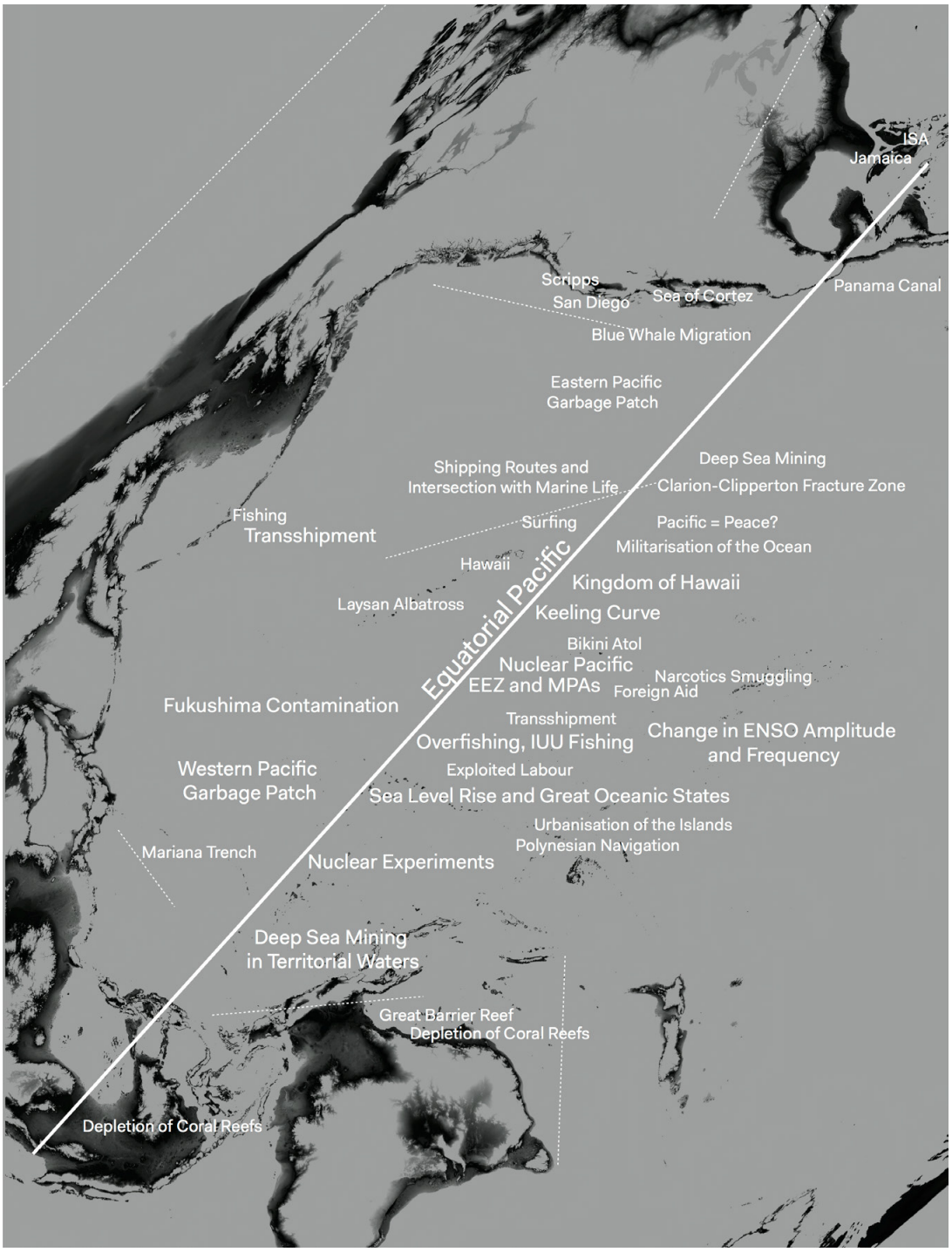
The nuclear tests have caused severe destruction over the landmass of the archipelago, notably with the detonation of the bomb known in the West as the Tsar Bomba, the most powerful nuclear weapon ever created, whose destruction range reached a radius of about 100 kilometers. The nuclear fallout and the dumping of nuclear waste in the sea spread all over the North Sea and Arctic Ocean.[205] The indigenous population of the region, who were forcefully displaced during the rezoning of the islands into various testing sites, were the victims of high radiation doses. The most aggravatedly affected by radiation exposure were the semi-nomadic Sami people of the Arctic region and the former inhabitants of Novaya Zemlya, the Nenets people, a Samoyedic ethnic group native to Northern Arctic Russia. The Vepsians, Karelians, and Komi people, living along the Northern Russian coast were also affected. Causes of the spread have been thought to have emerged from radioactively contaminated waters and lichen, which in turn caused high strontium levels in reindeer, a primary element of the local diet. Other indigenous populations were affected by fallout and radioactive contamination because of their diets, but no epidemiological studies were ever performed to assess the health effects on the people living around Novaya Zemlya.

→ Novaya Zemlya. Photo: Vasilyev Serge, Under CC BY 2.0

204. The information presented in this trajectory is based on these data sets. http://www.iaea.org/inis/collection/NCLCollectionStore/_Public/31/060/31060372.pdf

205. Nils Bøhmer et al, "The Arctic Nuclear Challenge," Bellona Report volume 3 (2001), http://bellona.org/assets/sites/6/The_Arctic_Nuclear_Challenge.pdf.

# 3. EQUATORIAL PACIFIC




**Geographical Areas covered**

**Caribbean Sea; Panama Canal; Sea of Cortez; Pacific Ocean and the Clarion-Clipperton Zone; Hawaii; Marshall Islands; Palau; Molucca Sea; Bay of Bengal; Strait of Malacca.**

The Pacific Ocean has an area larger than all emerged land on the globe. It has double the area and more than double the volume of the Atlantic Ocean. Seemingly far from large inhabited areas, the Pacific is the site of a vast increase of human activities that are shaping the ocean in unprecedented ways. The intensification of human activities in the Pacific, a residue of the colonial systems of early modernity, has triggered a cascade of environmental problems that are threatening both natural and human systems. This research trajectory explores how this intensification is taking form and its main elements.

Ocean warming and sea level rise are directly threatening the great oceanic island nations of the Pacific and ocean acidification is causing major damage to coral reef ecosystems. Storms are changing in intensity and frequency and circulation patterns are rapidly changing, with vast impact on livelihoods. Illegal and undocumented fishing is a rising phenomenon, with very large impacts on global fisheries. Extraction of minerals from the seabed is becoming an alarming reality, with a possible great impact on vital global life networks.

The Anthropocene Pacific Ocean is marked by the growing impact of human activity at sea, an early signal of which were the nuclear tests conducted in the second part of the twentieth century. This trajectory combines data from global fishing surveys and ocean climate modelling with data on maritime transport systems and the environmental impact of nuclear testing.

↑ Armin Linke, Sea Level Rise at Kulili Plantation Village, 2017, Thyssen-Bornemisza Art Contemporary Collection, Photo: Courtesy the artist

**Pacific Knowledges: We Are the Oceans**

The formulation of an oceanic worldview[206] by Pacific scholars is particularly relevant today. Over the past decades scholars and oceanic people have created a vast decolonial archive challenging Western epistemologies and research practices as well as highlighted and contested multiple forms of injustice and exploitation that continue to shape and legitimate ocean policies.

From the perspective of indigenous researchers and thinkers, the Western concept of research is steeped in colonialism and the ways in which Western science has produced and legitimized imperialism. Maori scholar Linda Tuhiwai Smith's 1999 book *Decolonizing Methodologies: Research and Indigenous Peoples* offers a broad historical discussion of the issue in the Pacific context. "The word itself, 'research,'" she writes, "is probably one of the dirtiest words in the indigenous world's vocabulary."[207] She refers to the centuries-long experience of indigenous communities serving as the object of study to research expeditions, which she further encapsulates in the statement: "We are the most researched people in the world."[208]

206. Stefanie Hessler, ed., *Tidalectics: Imagining an Oceanic Worldview through Art and Science.*

207. Linda Tuhiwai Smith, *Decolonizing Methodologies: Research and Indigenous Peoples*, Second edition (London: Zed Books, 2012): 1.

208. Ibid., 3.

The collective memory of imperialism and the derogatory views of indigenous ("savage") cultures, according to Tuhiwai Smith, is preserved in the ways in which knowledge about indigenous people is collected, classified, and archived in Western museums and institutions and how this archive is subsequently projected back onto Pacific islanders. "Research is one of the ways in which the underlying code of imperialism and colonialism is both regulated and realized," she writes.[209] The systemic dissemination of research in the former colonies through a network of scientific institutions and societies provided the opportunity for the installation of researchers and missionaries who in turn were in close contact with the imperial centers of Europe. It was also often the travelling explorers and adventurers who brought "stories" about land and people home and fixed them in charged, exotic milieus.

Although the situation has changed considerably in the past few decades—with regional differences between the Pacific island nations, Australia, and New Zealand /Aoetearoa—the question of research into and the representation of indigenous peoples are nevertheless highly virulent. In the Pacific region, from which Tuhiwai Smith writes, a leading research center has been established with the founding of the Oceania Centre for Arts and Culture at the University of the South Pacific in Suva, Fiji in 1997, under the direction of the writer and theorist Epeli Hau'ofa. One of the achievements of this research center is to revitalize the traditions and knowledges of and from Oceania as a "sea of islands"[210]—with the aim of engaging with Pacific cultures from the perspective of the oceans and not, as a result of colonial land grabs, from the fragmented view of small island states and their geopolitically determined borders. Reviving the traditions of the great Pacific navigators and the myths and cosmologies of the peoples of Oceania serves to re-conceive of their world from the perspective of the surrounding ocean as far as they could traverse it.

Hau'ofa describes the ancient hydro-geography of Oceania as the model for a new intellectual oceanic cartography, which breaks down the constrictions that have squeezed inhabitants into miniature island states over the past few centuries. He concludes his influential text "Our Sea of Islands" with an emphatic appeal that can be read as an act of political liberation, but also as a metaphorical comparison that belongs in posthumanist epistemologies. "Oceania is humanity rising from the depths of brine and regions of fire deeper still, Oceania is us. We are the sea, we are the ocean, we must wake up to this ancient truth and together use it to overturn all hegemonic views that aim ultimately to confine us again, physically and psychologically, in the tiny spaces which we have resisted accepting as our sole appointed place, and from which we have recently liberated ourselves."[211]

209. Ibid., 7.

210. Epeli Hau'ofa, "Our Sea of Islands," *In A New Oceania: Rediscovering Our Sea of Islands*, ed. Eric Waddell and Vijay Naidu (Suva: School of Social and Economic Development, University of the South Pacific., 1992), 2–16.

211. Ibid., 16.

### Militarization of the Pacific Ocean

*what will*
*the weapons,*

*submarines, ships,*
*aircrafts and*

*soldiers of*
*22 nations*
*take from*
*us?*

*[...]*

*is ocean*
*memorial or*

*target? monument*
*or territory?*

*economic zone*
*or mākua?*

Extract from *understory* by Craig Santos Perez
(a poem written during RIMPAC 2014)

→ The aircraft carrier USS Kitty Hawk (CVN 63) sails in formation with Australian, Canadian, South Korean and U.S. Navy ships during a Rim of the Pacific (RIMPAC) 2008. Photo: Marion Dioss, under CC licence.

The militarization of the oceans is a fundamental "safeguarding" process of the global energy supply. The infrastructure serving the oil market is the same infrastructure used for military purposes, making the geopolitics of war crucial to the politics of capital accumulation.[212] This co-constitutive relationship between militarization and trade sheds light on a vital mission of the US navy, that of securing the flow of oil. For example, the US fifth fleet has been patrolling the chokepoints of the maritime waterways

212. Laleh Khalili, "The geopolitics of maritime transportation in the Middle East", Conversation Recorded with Laleh Khalili in London The Funambulist, May 18, 2015. https://thefunambulist.net/podcast/laleh-khalili-the-geopolitics-of- maritime-transportation-in-the-middle-east.

that connect the Arabian Peninsula to Western markets long before issues of petropiracy emerged. Both a protector and consumer of energy, militarization is the largest single contributor to of environmental destruction in the world, as suggested by numerous studies.[213] The protection of energy supplies requires constant patrolling and the establishment of numerous overseas base networks, operations which in turn require a large consumption of energy. The Pentagon alone is accountable for consuming the largest amount of energy in the world, while also being the biggest institutional contributor to global carbon emissions. Despite this striking reality, the Pentagon has been exempted from all the major international climate accords and from domestic carbon emission legislation.[214]

→ Attack submarine USS Key West returns to its base in Guam (2017). This image was marked with a CC BY 2.0 license.

The intrinsic relationship of militarization and the supply of global energy is apparent in the longstanding US imperial objectives in the Pacific Ocean. American occupation in the Equatorial Pacific began in the mid-19th century with mining activities in the Guano Islands led by American companies. The extractive activities were legitimized by the "Guan Islands Act" of 1856, a federal law that enabled US citizens to take possession of "unclaimed" islands containing guano deposits. After complete depletion of the guano resources, the US maintained an interest in these islands for the solidification of commercial and military routes between Australia and California, leading to ventures such as the American Equatorial Islands Colonization Project, which implied the construction of weather stations and landing fields on the islands. Other islands and atolls like American Samoa, were later claimed as essential to fuel the US military and became ruled by the Navy as coaling stations.[215] The catastrophic environmental consequences brought by the history of such US trans-oceanic territorialism in the

213. See Anne McClintock, "Monster: A Fugue in Fire and Ice," e-flux-Architecture, June 2020. See also see Jacob Darwin Hamblin, Arming Mother Nature (Oxford: Oxford University Press, 2013); Robert Marzec, Militarizing the Environment. Climate Change and the Secuiry State (Minneapolis: Minnesota, 2013); Christian Parenti Tropic of Chaos (New York: The Nation, 2013)

214. Arthur Neslen, "Pentagon to Lose Emissions Exemption under Paris Climate Deal," *The Guardian*, December 2015.

215. See Elizabeth DeLoughrey,"Towards a Critical Ocean Studies for the Anthropocene," in *English Language Notes* (Duke University Press, 2019); see also David A. Chappell "The forgotten *Mau*: Anti-Navy Protest in American Samoa, 1920-1935," in *Pacific Historical Review* 69, no. 2 (2000).

Pacific Ocean have deeply affected the inhabitants of the ocean's low-lying islands. The more recent establishment of military exclusive zones to test mass destructive weapons have now left these communities to cohabit with a legacy of leaking nuclear waste, combined with rising sea levels.

The world's largest ocean is also the "playground" for the world's largest maritime "war game." Since 1971, the Equatorial Pacific Ocean has served as the main stage for the destructive "Rim of the Pacific Exercise" (RIMPAC)—the maritime warfare exercise administered by the United States Navy's Indo-Pacific Command, and headquartered at Pearl Harbor, in conjunction with the Marine Corps, the Coast Guard, and Hawaii National Guard. Held biennially in Honolulu, the large-scale exercise invites military forces from the Pacific Rim and beyond to participate in "a unique training opportunity that helps participants foster and sustain the cooperative relationships that are critical to ensuring the safety of sea lanes and security on the world's oceans."[216] Under this auspice, past maritime war games have included exercises in ship-sinking and torpedo usage. The latest edition of 2018 marked the largest maritime exercise in history, with an attendance of 25 thousand military personnel, nearly fifty naval ships, two hundred aircraft, and five submarines. It also saw a record of 25 participant nations, with the evident exception of the People's Republic of China, who was disinvited due to its extended reclamation and military buildup in the South China Sea, operations that have caused increasing concern to the Pentagon and its claimed supremacy over the Pacific.

While this year's RIMPAC iteration has been postponed to 2021 amid Covid-19 pandemic concerns, it would have been the first fleet exercise to incorporate emerging unmanned technologies, along with information warfare and tactical cyber teams, meant to "replicate a modern conflict against a peer adversary."[217]

**Nuclear Tests and Their Aftermath**

After World War II, the United Nations granted the United States administrative authority over the Marshall Islands. Following this agreement, from 1946 to 1958, the United States detonated sixty-seven nuclear weapons over the atolls of Bikini and Enewetak. From 1957 to 1958, the United Kingdom conducted nine atomic and hydrogen bomb tests at Christmas and Malden Islands. From 1960 to 1996, France carried out 193 nuclear tests in French Polynesia in the South Pacific. While the United States has recognized the impact of its nuclear experiments in the Marshall Islands, albeit with extremely poor measures of "compensation," the United Kingdom and France have yet to acknowledge acts of nuclear colonialism, and the ongoing legacy of its deadly materiality.

The large amount of residual contamination was acknowledged by the US in the late 1970s by declaring Bikini permanently uninhabitable. The US deployed military forces to push the nuclear waste at Enewetak into the open lagoon. Radioactive plutonium was dumped into the crater that had

216. "RIMPAC is the world's largest international maritime exercise" (US Navy, "RIMPAC 2014")

217. Megan Eckstein, "Large Scale Exercise 2020 Will Be Postponed Amid COVID-19 Pandemic Concerns," in USNI News, March 2020.

been left by an atomic bomb explosion, and then covered with a 115-meter diameter and 46-centimeter thick dome of cement at sea level. The resultant Runit Dome, known locally as The Tomb, lies 1100 kilometers to the west of the capital of the Marshall Islands, Majuro. Like the Bikini Atoll, the place is deemed "too hot" in radioactive terms for human inhabitation. Yet populations have since resettled there and are reclaiming their ancestral lands.

→ Julian Charrière, Aomen I - Terminal Beach, 2016, Thyssen-Bornemisza Art Contemporary Collection, Photo: Courtesy the artist | Galerie Tschudi, Zuoz and Ralph Feiner, Malans, 2017

The nuclear waste was buried in the coral atoll, which is by nature porous. Climate change specialist Michael Gerrard has asserted that the bottom of the dome is made of the permeable soil that was left behind by the nuclear explosions. The idea of lining the bottom of the crater with cement was rejected for economic reasons, causing seawater to penetrate the dome.[218] A later study by the National Research Council found that these methods "were not fully successful," and left behind "unconsolidated [...] material that provide channels for water movement [...] at least part of the radioactivity contained in the structure is available for transport to the groundwater and, subsequently, to the lagoon."[219] The leaking of the dome places Enewetak at the intersection of nuclear waste and sea level rise. In recent years, late winter king tides have swept over Enewetak and other islands, choking crops and wrecking homes. The US Geological Surveys agency warns that the Pacific atolls will be uninhabitable within decades.[220]

As a result of radioactive fallout, Marshallese have suffered and continue to suffer from thyroid diseases, including very high rates of cancer. Marshallese women have experienced severe birth defects, giving birth

218. Michael B. Gerrard. "America's Forgotten Nuclear Waste Dump," *SAIS Review of International Affairs* volume 35, no. 1 (Winter–Spring 2015): 87–97, http://columbiaclimatelaw.com/files/2016/09/Gerrard-2015-06-Americas-Forgotten-Nuclear-Waste-Dump-in-the-Pacific.pdf.

219. National Research Council, Committee on Evaluation of Enewetak Radioactivity Containment, Evaluation of Enewetak Radioactivity Containment, 019026391 (Washington, DC: National Research Council, 1982), 29. See https://www.osti.gov/opennet/servlets/purl/16380884-BEowpi/16380884.pdf.

220. David A. Helweg, Sarah A. B. Nash, and Dan A. Polhemus, "The Pacific Islands Climate Science Center Five-Year Science Agenda, 2014–2018" Open-File Report, U.S. Department of the Interior U.S. Geological Survey, see https://pubs.usgs.gov/of/2014/1075/pdf/ofr2014-1075.pdf.

to babies with no bones in their bodies and with transparent skin.[221] The Marshallese have the second highest rates of type 2 diabetes in the world as a result of eating spam and other canned foods for decades after being told that the fish and fruit of their islands were too contaminated to ingest. Marshallese, who have been allowed by the Compact of Free Association (COFA) Treaty to move to the US and work without green cards, and without being granted citizenship, are currently the most impoverished ethnic group in the United States.

→ Operation Crossroads (1946), the first atomic bomb test at Bikini Atoll. Public domain

The United Nations Decolonization Committee has recognized French Polynesia as a non-self-governing territory and approved draft resolutions to have the General Assembly encouraging the administering Power of French Polynesia to recognize and compensate persons impacted by three decades of nuclear testing in the South Pacific Territory.[222] As in other Pacific Islands, there has been a popular anti-nuclear movement in French Polynesia, initially led by independent leaders such as Pouvanaa a Oopa in the 1950s, and ex-workers in the French nuclear testing military industrial complex, and the evangelical church. Currently, the movement is led by two organizations, Moruroa e Tatou and Association 193.[223]

In parallel to living with the legacy of nuclear waste, today the

221. The Marshallese have described these babies "jellyfish" or "grapes." "Many women die from abnormal pregnancies, and those who survive give birth to what looks like purple grapes, which we quickly hide away and bury." This quote is attributed to Marshall Islander Lijon Eknilang who appeared before the International Court of Justice (ICJ) in The Hague in November 1995. Quoted in Peter Cohen, "Bikini's Tragic Heritage: The World's Most Atomic Atoll is Recognized by the UN," *In These Times* (September 15, 2010).

222. General Assembly of the United Nations, "Concluding Annual Session, Special Decolonization Committee Approves Draft Resolutions on French Polynesia, 4 Other Non-Self-Governing Territories" (June 2019). See https://www.un.org/press/en/2019/gacol3340.doc.htm.

223. See Nabil Ahmed, "T5.4-P20 Nuclear Pacific: An International Public Inquiry on French Nuclear Testing in French Polynesia."

Marshall Islands and the central Pacific Ocean are among the most vulnerable locations threatened by sea level rise. A 60-centimeter increase in sea level by the end of the century may inundate three-quarters of the country.

The geo-localization of the various nuclear tests sites included in this trajectory is based on data sets from The Oklahoma Geological Survey Observatory: Catalog of Nuclear Explosions and Nuclear Explosions, 1945–1998.

**Nuclear Colonialism**

Despite the fact that the long- and short-term effects of nuclear contamination on humans and the environment along with the lethal dispersion of radioactive isotopes were known since as early as the 1960s, Western powers who have conducted nuclear tests were unwilling to take responsibility for the repercussions of these tests. Ward Churchill and Winona LaDuke have called this "radioactive colonialism,"[224] pointing out how this form of Western-centrism was directed for decades primarily against indigenous communities.

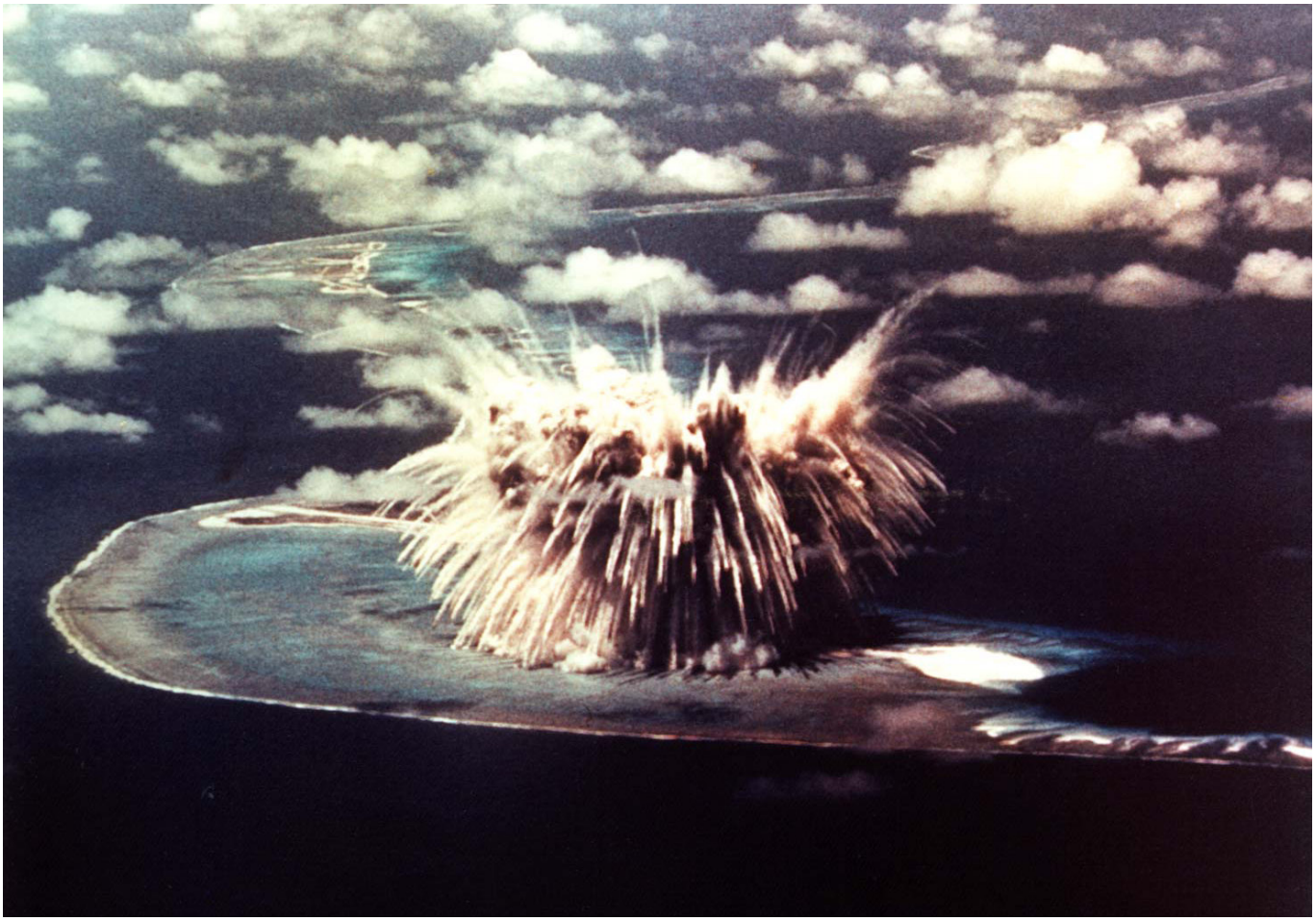
Nuclear colonialism in the Pacific is indeed modeled after familiar patterns: the appropriation of Pacific territories (as "terra nullius"), their restructuring into military zones, the resettlement of the frontline population, conducting tests under often precarious conditions, and the sheer "optical" removal of contaminated surfaces and substances were followed by the complete or partial disengagement of Western nations from what has been called "the most toxic place in the world."[225] Corresponding reparations, medical treatments, financial compensation, and cultural reconstruction have all failed to materialize or have been very hesitantly introduced only in recent years.

Environmental scholar Elizabeth DeLoughrey analyzes the epistemological flaw in this lack of respect for postcolonial perspectives as a distinctive shortfall of the Anthropocene agenda. She writes: "The lack of engagement with postcolonial and indigenous perspectives has shaped Anthropocene discourse to claim the novelty of crisis rather than being attentive to the historical continuity of dispossession and disaster caused by empire."[226] As in other instance of anthropogenic victimizations, it is necessary to precisely locate the "microphysics" of violence—to ground it, so to say, if only the geological soil were concerned. Similarly, one must be aware of the possibility that the Anthropocene did not erupt as the collateral damage of modernity, but rather is set in a deliberate ecocidal continuity against peoples and places that constituted the colonial margins of empire. It is precisely in these *voided* sites where plantation slavery, extractivism, and nuclear detonations were tested and practiced over a long period of time and the Anthropocene was materially fueled (with coal, fossil fuel, and so on). Nuclear colonialism is a colonization that affects the past and the present, but also, as Karen Barad

224. Ward Churchill and Winona LaDuke, "Native America: The Political Economy of Radioactive Colonialism," *Insurgent Sociologist* vol. 13, no. 3 (April 1986): 51–78.

225. Karen Barad, "After the End of the World: Entangled Nuclear Colonialisms, Matters of Force, and the Material Force of Justice," *Theory & Event* vol. 22 no. 3 (2019): 525.

226. Elizabeth M. DeLoughrey, *Allegories of the Anthropocene* (Durham: Duke University Press, 2019), 2.



↑ US nuclear weapons test at Eniwetok in 1956, International Campaign to Abolish Nuclear Weapons, under CC license

writes, it is one that continues to have an effect in all future: "nuclear nature is such that it has already colonized the future as well, making evident that nuclearity in its specificity radically scrambles, if not disassembles, the imperialist universalizing sequentiality of past-present-future."[227]

The interlacing web of relations taking place on the Pacific Islands, namely the encounter of sea level rise with nuclear waste, demand a "political ecology of things"[228] that recognizes the *political* capacity of nonhuman forces in events, a philosophy of materialities that acknowledges the agency of human-nonhuman assemblages. Speaking of the Runit Dome, Barad, a physicist and theoretician of "agential realism," disrupts the colonial practices of violence that are written into physics, specifically quantum field theory. "The void—a much-valued apparatus of colonialism, a crafty insidious imaginary, a way of offering justification for claims of ownership in the 'discovery' of 'virgin' territory—the particular notion that 'untended,' 'uncultivated,' 'uncivilized' spaces are empty rather than plentiful, has been a well-worn tool used in the service of colonialism, racism, capitalism, militarism, imperialism, nationalism, and scientism."[229]

227. Ibid.
228. Jane Bennett, *Vibrant Matter: A Political Ecology of Things* (Durham: Duke University Press, 2010).
229. Barad, "After the End of the World," 525.

↑ Armin Linke, Photoessay related to the "Prospecting Ocean" project, 2016-2017
Protest against deep-sea mining project in the Bismarck Sea, Karkar Island, Papua New Guinea, 2017, Commissioned by TBA21–Academy, Thyssen-Bornemisza Art Contemporary Collection, Photo: Courtesy the artist

**Great Pacific Island Nations and the Changing Oceans**

*and after all this*
*tell them about the water*
*how we have seen it rising*
*flooding across our cemeteries*
*gushing over the sea walls*
*and crashing against our homes*
*tell them what it's like*
*to see the entire ocean __level__ with the land*
*—Kathy Jetñil-Kijiner, "Tell Them"*[230]

The rising sea levels is one of the most pressing challenges facing the great Pacific island nations, especially those dwelling on low-lying islands and atolls. As some regions have experienced significantly higher sea levels than the global average (three times higher in Micronesia), population displacements have already taken place in Fiji, Kiribati, the Solomon Islands, Papua New Guinea, and Vanuatu. In fact, in 2005, the villagers of Lataw on

230. Kathy Jetñil-Kijiner, "Tell Them," see https://www.kathyjetnilkijiner.com/tell-them/

Tegua island in Vanuatu were declared the world's first climate refugees by the United Nations. In Papua New Guinea's Han Island thousands of islanders are being resettled to Bougainville Island. Rising sea levels and erosion have caused some islands in the South Pacific to completely disappear.

Coastal erosion, saltwater intrusion, and draught, as well as king tides and storm surges are the harbingers for future transformations affecting oceanic communities. These communities largely depend on the ocean for food security, work, livelihood, and culture. There is consensus that the sea level will continue to rise at an accelerated pace and will cause a significant increase in the frequency and severity of coastal flooding in the Pacific Islands in the near future.[231]

At the 2017 UN Ocean Conference, the international community recognized that the ocean is at the center of the 2030 Sustainable Development Agenda, setting forth a number of sustainable development goals (Sustainable Development Goal14).[232] These include the sustainable management and protection of marine ecosystems, including the conservation of 10 percent of the ocean, reducing pollution, the effective regulation of all fishing, and the discontinuation of subsidies that contribute to overcapacity of fishing fleets and overfishing. Research programs connecting exposed communities across the planet, such as the One Ocean Hub (OOH) initiative,[233] were set up to carry out innovative research and integrated knowledge translation with the goal of enabling integrated ocean governance for equitable and inclusive sustainability.

Aiming to support vulnerable groups in Africa and small island nations in the Pacific, the OOH's main areas of research have been set to address a series of issues, including global law and governance for integrated ocean management; emotional connection with the ocean; sustainable and equitable fisheries in an ecosystem context for human wellbeing; the role and potential of (non-fisheries) offshore marine resources to support a sustainable blue economy; and transformative governance for an inclusive, innovative, and responsible blue society. The role of these knowledge hubs is to share scientific data, best practices, and know-how to enhance understanding, cooperation, and policy coherence at all levels on the ocean's role in realizing sustainable futures.

**The Great Pacific Garbage Patch**

The Great Pacific Garbage Patch (GPGP) is in many ways a homage to the blights of global consumer culture. It is often misunderstood to be a solid thing, something between a compost heap and an island, when in fact it is constituted by diffuse plastic debris and is more like an expanding vortex, swirling around the North Pacific Subtropical Gyre and covering an

231. Jerome Aucan, "Effects of Climate Change on Sea Levels and Inundation Relevant to the Pacific Islands," *Science Review* (2018), see https://reliefweb.int/sites/reliefweb.int/files/resources/4_Sea_Level_and_Inundation.pdf.

232. UN Ocean Conference 2017, "Sustainable Development Goal 14," https://sustainabledevelopment.un.org/sdg14

233. https://oneoceanhub.org/

area of roughly 1.6 million square kilometers.[234] And because it is a snaking, shifting element composed of microplastics, It is also undetectable by satellite imagery, making it "a convenient allegory for an economic system that sweeps all of its problems just out of sight."[235] This concealment is compounded by the many challenges for plastic sampling and counting methodologies, which are required to understand vertical and lateral plastic pathways in the ocean. What is clear is that the GPGP is expanding quickly and its ecological impacts are growing more profound.[236]

The persistence of plastic waste in our oceans has affected both natural habitats and human health. Within this debris, marine mammals have been entangled, surface feeders like birds and turtles have been poisoned, and invasive species have been transported. Through the process of bioaccumulation, food chains have been contaminated by microplastics. Interactions between biota and debris also impact plastic distribution, as, for example, encrusting organisms, ingestion, and incorporation into fecal pellets encourage particle sinking. Such meetings give rise to various alliances between debris and life, which raise ontological questions about the nature of living or non-living bodies that together characterize the "plastisphere."[237]

The GPGP has forcefully entered the public imagination following various media and documentary representations, notably in the BBC documentary *Blue Planet II*, which has made it a fascinating case study for impactful science communication. However, marine plastics research is a young field and much remains to be studied. One of the many misconceptions that surround the GPGP is the belief that the ocean can simply be cleaned up, like sweeping away debris from a pool. This rests on the techno-optimist premise that innovation, rather than behavioral change, can remedy the impact humans have had on the environment, and glosses over the agency of the plastics already at sea. While technology cannot erase the problem, there have been several attempts to mitigate the GPGP's expansion, ranging from The Ocean Cleanup's use of a high-density polyethylene pipe to Plastic Tide's implementation of drones to track and cap its spread. However, these surficial efforts reflect the lack of understanding about the fate of plastic debris and the size of reservoirs below the surface: plastic accumulation in the deep sea is barely constrained, although it is thought to account for 99 percent of the global reservoir.[238] What is required to deal with the GPGP is a deep rethinking of the relationship between private ownership and accountability.

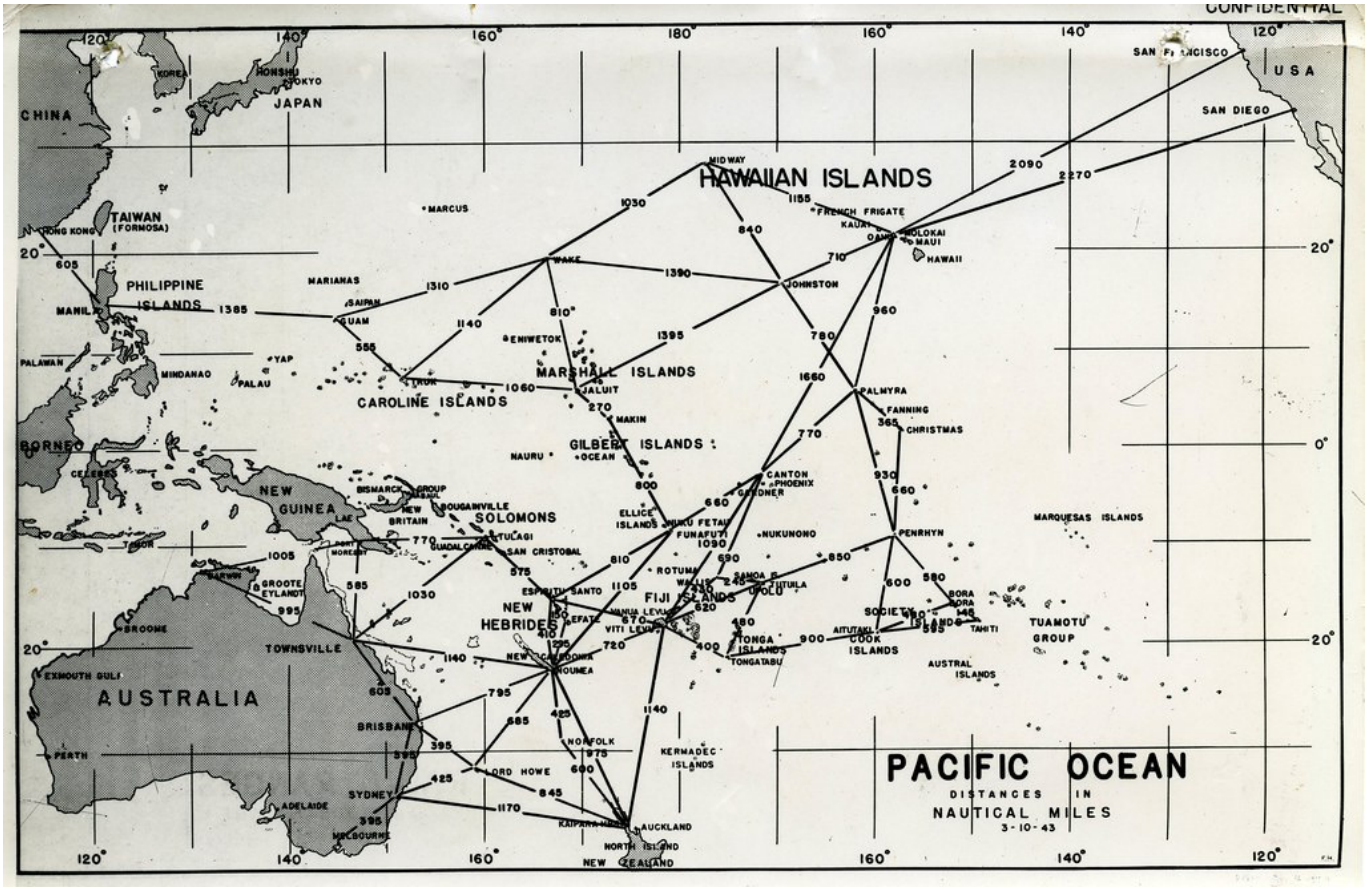
234. See "The Great Pacific Garbage Patch" on the Ocean Cleanup foundation: https://theoceancleanup.com/great-pacific-garbage-patch/

235. Joe Amendola, "The Great Pacific Garbage Patch is the Only Wonder our World has Produced," *The Outline* (August 19, 2019), https://theoutline.com/post/7819/the-great-pacific-garbage-patch-is-the-only-wonder-our-world-has-produced?zd=1&zi=5obbzoww.

236. L. Breton et al., "Evidence that the Great Pacific Garbage Patch is rapidly accumulating plastic," *Science Reports* vol 8, article no. 4666 (2018), https://doi.org/10.1038/s41598-018-22939-w.

237. Kim De Wolff, "Plastic Naturecultures: Multispecies Ethnography and the Dangers of Separating Living from Nonliving Bodies," *Body & Society* vol. 23, issue 3 (September 2017): 23–47, https://doi.org/10.1177/1357034X17715074.

238. Ian A. Kane et al., "Seafloor microplastic hotspots controlled by deep-sea circulation," *Science* (April 2020). DOI: 10.1126/science.aba5899




↑ Pacific Ocean map with distances in Nautical Miles, 1943, under CC BY-NC 2.0 license

**Exclusive Economic Zones of the Commonwealth Countries**

The Pacific Islands region includes about 200 high islands and some 2,500 low islands and atolls, situated mainly in the Western and Central Pacific. Here, the dispersed nature of the region's land has several consequences for the management of the countries' resources, especially for their fisheries. Coastal fishing is predominantly conducted by small-scale commercial and subsistence fisheries whereas offshore fishing is undertaken mainly by large, industrial-scale fishing vessels, operated by foreign nations.

The establishment of Exclusive Economic Zones (EEZs) by the 1982 United Nations Convention on the Law of the Sea (UNCLOS), changed the allocation of fishing rights from the international commons ("freedom of the seas") to coastal states, many of which were so-called "developing" island states. However, article 62 of the UNCLOS obliges coastal states to share their surplus fish and promote the objective of optimal utilization of living resources within their EEZ.[239] The article reflects the interests of distant water fishing nations (DWFNs) with regards to the limited living resources within their EEZs. Faced with the impossibility of optimally harvesting their EEZs, the coastal Commonwealth states in the Pacific are obliged to grant

239. See article 62.3: "In giving access to other States to its exclusive economic zone under this article, the coastal State shall take into account all relevant factors, including, inter alia, the significance of the living resources of the area to the economy of the coastal State concerned and its other national interests, the provisions of articles 69 and 70, the requirements of developing States in the subregion or region in harvesting part of the surplus and the need to minimize economic dislocation in States whose nationals have habitually fished in the zone or which have made substantial efforts in research and identification of stocks."

other states access to any surplus beyond their harvesting capabilities. According to a study, "DWFNs still control the key aspects of the global fisheries trade: technology; finance; trade (including access to the most lucrative markets); and production of the final end uses. DWFN continue to maximize and maintain their control inherent in their positioning at the end of the production cycle."[240]

The history of industrial offshore fishing in the region is closely related to Japan's economic activities, which were awarded control of much of Micronesia after World War I. By the late 1970s, several fully commercial Japanese and American purse-seine operations were present in the Western Equatorial area of the Pacific Islands. The successful introduction of purse-seine fishing accounts for much of the expansion of the tuna catch in the region. According to the 2018 report on "Fisheries of the Pacific Islands" compiled by the Food and Agriculture Organization of the United Nations (FAO), approximately 1,100 industrial-scale offshore fishing vessels operate in the EEZs of Pacific Island countries, mainly using purse-seine and longline gear to catch tuna.[241]

By the middle of 2016, about 250 tuna purse-seiners flagged in nineteen countries operated in the Pacific Islands region. Around that time, about 1.8 million tons of tuna were caught in the EEZs of these Pacific Island countries, about two-thirds of which were skipjack catches and 20 percent of which were yellowfin tuna catches. However, only about 20 percent of these catches were made by tuna vessels based in Pacific Island countries. In the Cook Islands, Kiribati, Nauru, Tuvalu, and Vanuatu, for instance, this percentage increases to nearly 100 percent.[242] In Palau, Papua New Guinea, the Solomon Islands, and Tonga, the share is distributed fairly evenly (about fifty-fifty). In addition to supporting local employment as part of the (mostly female) tuna processing work force, all Pacific Island countries receive fees for foreign fishing activities in their waters. An estimated amount of $ 340 million were paid out in 2015 in access fee payments.

Complex negotiations started in the mid-1990s between the coastal states of the Western and Central Pacific, and distant-water fishing nations led to the Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean. The Convention came into force in 2004 with the objective to ensure, through effective management, the long-term conservation and sustainable use of highly migratory fish stocks in accordance with the 1982 UNCLOS and the 1995 UN Fish Stocks Agreement.

The Oceanic Fisheries Programme (OFP) periodically assesses the condition of the four main species of tuna in the region, using all available information from the fishery, including catch effort and size composition data for the main fisheries, as well as tagging data where available. Currently, the program assesses that the four main tuna stock are corre-

240. Quentin A. Hanich and Ben M. Tsamenyi, "Exclusive economic zones and Pacific developing island states–who really gets all the fish?" (Paper presented as part of the conference Sharing the Fish, 2006, Perth, Australia).

241. FAO 2018 report: "Fisheries of the Pacific Islands: Regional and national information," see

http://www.fao.org/3/I9297EN/i9297en.pdf.

242. Kiribati produced by far the largest catches amounting to over 700,000 tons per year, followed by PNG with 450,000 tons, then Nauru and Micronesia with each about 170,000 tons.

sponding to the maximum sustainable yield and are most likely not in an overfished condition. Various programs on national, regional, and international level have been set up to devise management plans and activities in the Pacific waters.

EEZs shown on the trajectory are based on marineregions.org.

**Transshipment in the Pacific**

The data collected and "reconstructed" by the Food and Agriculture Organization (FAO) provides a fairly accurate understanding of industrial fishing. A primary limitation of official data sets is that individual countries with competing national interests self-report data to international fisheries organizations; this leads to misreporting that may compromise spatial management. The publicly accessible, globally available vessel transmission system known as the Automatic Identification System (AIS) has recently provided global fishing maps at unprecedented spatial and temporal resolution, allowing the direct observation of over 70,000 industrial fishing vessels. AIS can be used to observe up to 75 percent of all fishing vessels larger than 24 meters, thus providing a high-resolution assessment of global fishing independent of self-reporting rules for states. A close look at the fisheries around the EEZs of the Pacific Island countries reveals intense fishing activities around them. According to Greenpeace, "Pirate fishing – illegal, unreported and unregulated fishing – is rife in the Pacific. Pirates leave communities without much needed food and income and the marine environment smashed and empty."[243]

Transshipment is thought to be a factor in enabling illegal, unreported, and unregulated (IUU) fishing, extracting an estimated 11 to 26 million metric tons from the world oceans each year.[244] Transshipment operations are employed to circumvent existing controls on IUU activities and take place just outside the EEZ borders. Many unauthorized and unregulated transshipment operations, including those in artisanal fisheries, have developed into major economic drivers that severely impact vulnerable coastal communities and the long-term health of fish stocks.

Global Fishing Watch, a projected launched by SkyTruth in 2016 together with Google and Oceana, has produced algorithms that allow it to identify possible transshipment events at sea. Global Fishing Watch's report on transshipment activity shows that regions with IUU have more transshipment behavior, with most vessels returning to ports in Asia. The Equatorial Pacific and the South Indian Ocean are among the global hotspots of transshipment activity, where high-value species such as tuna are fished.

243. "Fisheries of the Pacific Islands: Regional and national information," 55.

244. See Daniel Pauly and Dirk Zeller, "Catch reconstructions reveal that global marine fisheries catches are higher than reported and declining," *Nature Communication* vol. 7, 10244 (2016); also David J. Agnew et al., "Estimating the Worldwide Extent of Illegal Fishing," ed. Stuart A. Sandin, *PLoS ONE* vol. 4, no. 2 (25 February 2009): 4, https://doi.org/10.1371/journal.pone.0004570.

**The Degradation of Coral Reefs**

According to the United Nations Environment Programme, severe marine heatwaves (with sea surface temperature rising 2–3°C above normal maxima in just a few months) have recently become a common feature of global ocean conditions, causing an unprecedented increase in the frequency and severity of mortality events in marine ecosystems, including on coral reefs. Coral bleaching is in part caused by these increasingly severe thermal conditions, which lead corals to expel vital algae that live in its tissues, resulting ultimately in the death of these animals. The degradation of coral reefs could result in the collapse of ecosystem services that sustain over half a billion people globally.[245]

The trajectory uses data from the "Reefs at Risk Revisited" report, which provides a detailed assessment of the status of and threats to the world's coral reefs. It evaluates threats to coral reefs from a wide range of human activities, and includes an assessment of climate-related threats to reefs. It also contains a global assessment of the vulnerability of nations and territories to coral reef degradation.

The structural integrity of coastal marine habitats is dependent on the abundance of a small number of dominant species of mangroves, saltmarshes, seagrasses, kelps, and coral reefs that stabilize sediments and provide shoreline with critical protection from storms. They are also important nursery habitats for fisheries. Losses of these species due to development and climate change reduces biological structural stability and complexity. Global losses have been alarming, reaching 50 percent of mangroves and 30 percent of seagrasses. Global declines in living coral cover on reefs is also highly variable but commonly exceeds 50 percent throughout the Caribbean and Indo-Pacific.

→ Research process for 'A Coral Pavilion. Pavane for an Extinct Civilisation', a collaborative work by architect and designer Neri Oxman (MIT), sound artist Jana Winderen and sound expert Tony Myatt. Photo: TBA21–Academy, 2013

245. William P. Leggat et al., "Rapid Coral Decay Is Associated with Marine Heatwave Mortality Events on Reefs," *Current Biology* vol. 29, no. 16 (August 2019): 2723-2730.e4, https://doi.org/10.1016/j.cub.2019.06.077.

→ Bleached staghorn coral, taken by Matt Kieffer at the Great Barrier Reef. This image was marked with a CC BY-SA 2.0 license.

Healthy coral reefs exist in symbiosis with dinoflagellates that live within their tissues and are critical to coral nutrition and calcification. Extreme heat breaks down this symbiosis whereby the corals evict the symbiont, which leaves them ghostly white, hence their description as bleached. This is commonly fatal to the corals unless the symbiosis is reestablished within weeks. Mass bleaching events are increasingly frequent and raise questions about the very survival of coral reefs. The most recent extreme example was in 2015–16, when most corals along the northern Great Barrier Reef bleached and died; similar mass bleaching and mortality occurred across the Pacific.[246]

The Coral Triangle is a roughly triangular area of the tropical marine waters of Indonesia, Malaysia, PNG, Philippines, and the Solomon Islands. It is home to more than three-quarters of the world's reef-building corals and is recognized as the global center of marine biodiversity. Called the "Amazon of the seas" it is a global priority for conservation. Coral Triangle reefs have experienced severe mass coral bleaching and mortality events as temperatures have periodically soared. Between 2014 and 2017, a combination of the cyclical El Niño event with anthropogenic warming caused unprecedented increases in water temperature, leading to the worst bleaching event in history. However, a recent survey of the Sulawesi reefs, which are located at the heart of the Coral Triangle, found the corals to be surprisingly healthy. The findings suggest that these shallow Indonesian corals, where high levels of biodiversity are coupled with fast rates of growth and recovery, could be less vulnerable to climate change, as suggested by British scientist Emma Kennedy.[247]

However, according to marine biologist Jeremy Jackson, discussions about the coral reef crisis have been dominated by climate change, while omitting the localized effects of overfishing, land-based pollution,

246. Terry P. Hughes et al., "Global Warming and Recurrent Mass Bleaching of Corals," *Nature* (March 2017).

247. Johnny Langenheim, "AI identifies heat-resistant coral reefs in Indonesia," The Guardian, August 2018.

and loss of habitats due to coastal development. A recent study of changes on Caribbean reefs over the past fifty years demonstrates that reefs with effective local protections and governance have double the amount of living coral, more fish, and clearer waters than reefs without protections. These new findings show that to help reefs recover, we need to stop all forms of overfishing, establish very large marine protected areas, and impose strict regulations on coastal development and pollution while at the same time working to reduce the use of fossil fuels.[248]

**Deep-Sea Mining in the Clarion-Clipperton Fracture Zone**

The trajectory uses data from the International Seabed Authority (ISA) to locate deep-sea mining in the Clarion-Clipperton Fracture Zone (CCZ). The CCZ is a geological submarine fracture zone about 7,240 kilometers long, spanning 4.5 million square kilometers across the central Pacific Ocean at depths of ~4,000–5,500 meters. In 2016, the seafloor in the CCZ was found to contain an abundance and diversity of life, and more than half of the species collected there were new to science. The seabed is rich in polymetallic nodules, which are a potential mineral resource for copper, nickel, cobalt, iron, manganese, and rare-earth elements, and has thus been targeted for deep-sea mining. Because the CCZ is outside national jurisdiction, meaning it is not part of an Exclusive Economic Zone, deep-sea mining in this region is regulated by the ISA, which grants contracts to private entities to explore specific parts of the deep oceans outside national jurisdiction. Under ISA regulations, each contractor has the exclusive right to explore an initial area of up to 150,000 square kilometers. Currently, contracts for mining exploration in the CCZ have been granted to sixteen deep-sea mining contractors, with a total exploration area covering approximately 1 million square kilometers.[249]

The ongoing interest in extreme, deep-sea metal is mandated by the sharp increase in price and the rising demand on world markets for these resources, especially for batteries used in renewable energy systems. The speculative prospects of deep-sea mining are redrawing the colonial frontier, as industrial and geopolitical interests, like safeguarding national supplies, have deterritorialized mineral extractionism through international partnerships to Pacific Island nations such as Fiji, Nauru, Papua New Guinea, and Tonga, but also to Japan, New Zealand, and the Portuguese Azores archipelago. Countries with no access to sea resources are seeking to assert extraterritorial claims in the oceans and are lobbying with international policy entities.

Seabed mining has also become a controversial matter in certain Pacific states, whose EEZs potentially include valuable mineral deposits. The legal regime for these sites is situated under national jurisdiction, with states having the power to award leases to private ventures. Mineral exploration efforts are gradually progressing toward plans for mineral production. The most advanced case is the Solwara 1 project, exploring a massive sulphide deposit on the seafloor off the shores of Papua New Guinea, where prospec-

248. Jeremy Jackson et al., eds., "Status and Trends of Caribbean Coral Reefs: 1970–2012" Global Coral Reef Monitoring Network, 2014.

249. See National Oceanic and Atmospheric Administration Ocean Exploration and Research site, https://oceanexplorer.noaa.gov/explorations/18ccz/background/mining/mining.html.

tive miners Nautilus Minerals have met strong opposition from community groups concerned about the environmental and cultural implications of deep-sea mining.[250] Nautilus Minerals and other companies similar to it have employed narratives promoting mining at sea as a socially and environmentally preferable alternative to mining on land.[251] Although the status of the venture is currently uncertain, this and projects in other Pacific states are becoming emblematic of the "blue economy" concept, with all the contradictions and undercurrents of exploitation that it entails. The idea of "blue growth" suggests that resource extraction at sea can continue under the label of "sustainable development," moot when considered alongside the fact that satisfying this resource demand remains inherently unsustainable and harmful to the marine environment.[252]


↑ Armin Linke, Twenty-Second Session of the International Seabed Authority Assembly ISA, Kingston, Jamaica, 2016, lambda print mounted on alu-dibond with wooden frame and glass, 50 × 60 cm

250. Deep Sea Mining in Papa New Guinea, https://www.solwaramining.org/.

251. John Childs, "Greening the blue? Corporate strategies for legitimising deep sea mining," *Political Geography* vol. 74 (September 2019), https://doi.org/10.1016/j.polgeo.2019.102060.

252. See the work of the Transnational Institute on "blue growth": https://www.tni.org/en/bluegrowth.

**The Panama Canal**

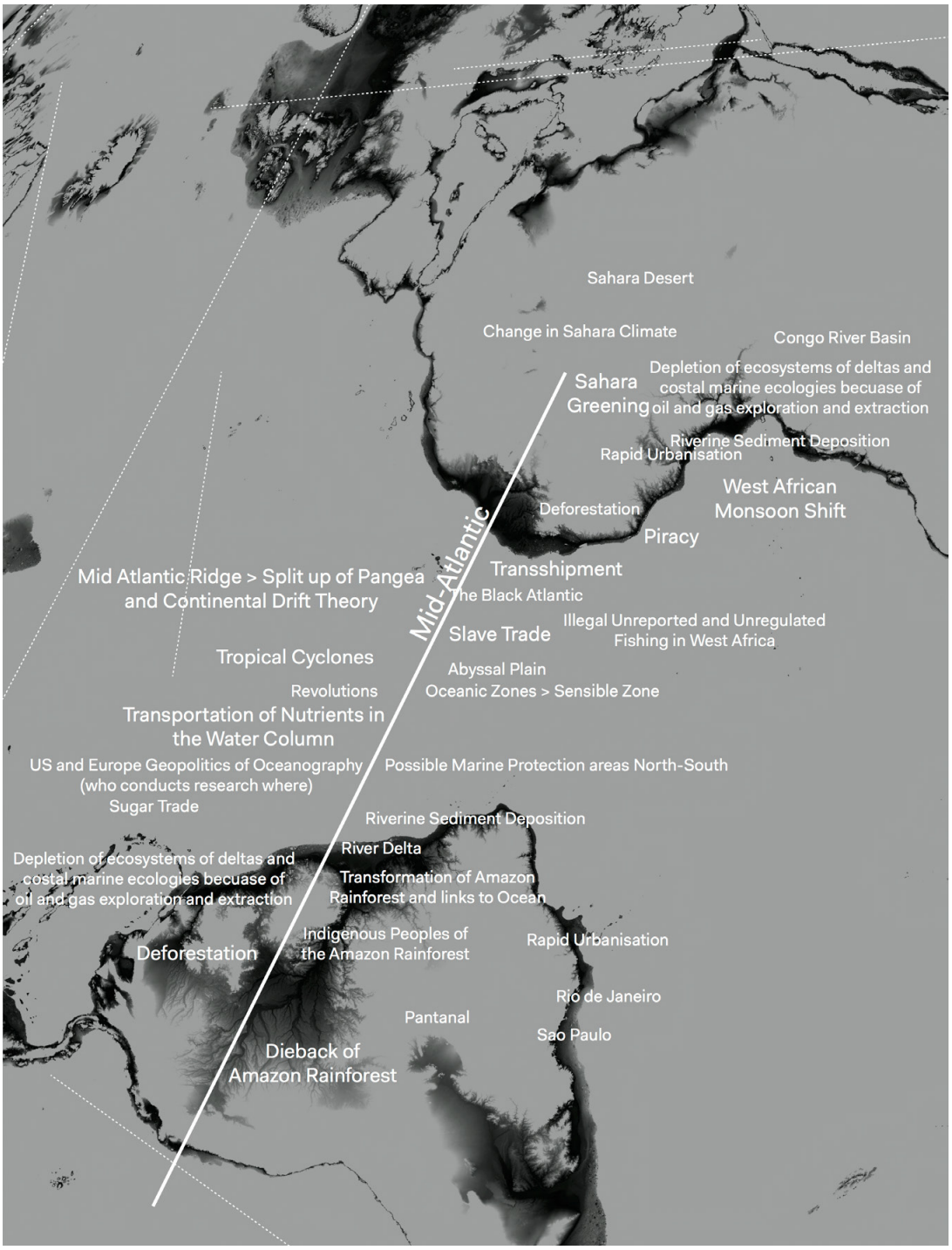
Constructed by the US military between 1904 and 1914, the Panama Canal is an imperial infrastructure, built to grant warships fast access to both the Pacific and the Atlantic Oceans. When in 1903 the US took on the canal project from the French, who tried to construct the canal in the late nineteenth century, the government of Panama granted the US the rights to the Canal zone "as if sovereign" and "in perpetuity." To operate and control the canal, the US installed the Panama Canal Zone, a 533 square miles, heavily subsidized, lush tropical area whose inhabitants were referred to as "Zonians." The historian Michael E. Donoghue positions the Panama Canal Zone as an imperial borderland where US power, culture, and ideology were projected and contested by Panamanians, who responded to occupation with protests and other forms of resistance.[253] During the Korean War, as many as 100,000 Americans lived in the Zone, at a time when the Panamanian population was about one million. In more peaceful times, the numbers were half that. In 1977, President Jimmy Carter signed a treaty signaling the beginning of the end of US involvement in Panama, and committed the US to leaving by the year 2000. Sixty percent of the Zone itself was immediately returned to Panama, in 1979. When in 1999 the final transfer of the canal to Panama was concluded, most of the American Zonians returned to the US.

The Canal's economic destiny was to set in motion global logistics. Upon gaining sovereignty in 2000, Panama's first autonomous act was to begin the $ 5.25 billion Panama Canal expansion project, building new sets of locks for post-Panamax ships. For years, the Canal Authority was mired in dispute with European contractors.[254] The expanded canal began commercial operations on June 26, 2016.

253. Michael E. Donoghue, *Borderland on the Isthmus: Race, Culture, and the Struggle for the Canal Zone* (Durham: Duke University Press, 2014).

254. Michael Fahy," Panama Canal contractors awarded $ 233mn in dispute," *Construction Week* (January 4, 2015), https://www.constructionweekonline.com/article-32005-panama-canal-contractors-awarded-233mn-in-dispute.

# 4. MID-ATLANTIC




**Geographical Areas covered**

**Western Sahel; Nigeria; Niger; Benin; Burkina Faso; Ghana; Lake Volta; Gulf of Guinea; Côte d'Ivoire; Liberia; Guinea-Bissau; Sierra Leone; Cape Verde; Mid-Atlantic Ridge; Amazon River Delta; French Guiana; Suriname; Brazil.**

This trajectory spans from the Western Sahel, Niger Delta, to the Amazon rainforest, following the vast aerosols transfers of nutrients from the Sahara to the green lungs of the planet. This system is a vital component of the earth system and it is changing at a fast pace due to global warming: the greening of the desert in Africa is triggering transformations thousands of miles away and is coupled with deforestation in the Amazon. New patterns of tropical cyclone formations in the ocean are emerging as a result of this process as well.

The trajectory follows the trade winds of the Mid-Atlantic, intersecting the deep-history of slave trade and the formation of the early modern Eurocentric world system of empires. At its extreme, we encounter complex depletions of coastal ecosystems caused by oil and gas explorations, the contemporary forms of slavery onboard illegal and undocumented fishing fleets, rising piracy, and transshipment activity that exceeds the limits of Exclusive Economic Zones.

The research trajectory indicates the non-local connections of the Anthropocene ocean: events deep in the forest affecting indigenous populations are linked to transformations thousands of miles away, and how the transformations of supply chains of fossil fuels is impacting the long-established historical relations between Africa and the Atlantic. This trajectory is a way to encounter the voices of those affected directly by the transformation of the Atlantic.

**The Black Atlantic and its Afterlives**

This trajectory is informed by Paul Gilroy's conceptualization of the "Black Atlantic,"[255] and the work of many preceding and contemporary thinkers working on the political economy of the slave trade and its neo-colonial afterlives.[256] The term is used to describe a specifically modern, Black culture induced by the experience and inheritance of the transatlantic slave trade and the plantation system in the Americas. The African diaspora is an extra-national, socio-political, and cultural phenomenon which challenges essentialist conceptions of country, community, and identity. Gilroy demonstrates how the transatlantic slave trade has been integral to Western colonial imperialism and modernity, and positions the Atlantic Ocean as a geopolitical actor in the formation of the Western capitalist world system.[257]

This trajectory departs from West African coastal states in the Gulf of Guinea such as the Republic of Ghana. The British colonial naming of the "Gold Coast" was a rendering of the previously established Portuguese *Costa do Ouro*, given to the region by the first Europeans to exploit the large reserves of gold in the soil of coastal territory, who were traders sent by Prince Henry the Navigator at the end of the fifteenth century. After less than a decade of exploitation and intervention in local trade, the Portuguese colonizers erected the São Jorge Mina Castle in 1482, a military structure which became the first European headquarter for trade and exploitation of African wealth in Sub-Saharan Africa. Soon after its construction, the fort became central to the Slave Coast of West Africa, acting as a transshipment entrepôt for enslaved Africans being displaced to the Americas. By the seventeenth century, most trade in West Africa concentrated on the sale of enslaved people, which was expanded by Dutch, French, and British enterprises until the abolition of slavery.

Recognizing the extended and transnational space of the Atlantic in the multiple histories of racial domination allows to break the limitations of national perspectives, which do not correspond with political or economic structures of domination. The forms of environmental racism taking place in the Niger Delta and South America today—evidenced in this trajectory—are among the enduring postcolonial dynamics that continue to affect the lives of communities who now find themselves at the forefront of climate change. Oil extraction by Western companies in the Nile Delta echoes the racial ecologies of colonial expansion that have eradicated indigenous epistemologies of the "natural environment."[258]

255. In *The Black Atlantic: Modernity and double consciousness* (Cambridge: Harvard University Press, 1995), Gilroy weaves together a community of thinkers such as Martin Delany, Frederick Douglass, W. E. B. Du Bois, Toni Morrison, and Richard Wright, along with Black Atlantic music, from jazz to hip hop, to understand Black diasporic intellectual production as a critique of cultural nationalism.

256. It is important to note that while Gilroy is invoked as a leading figure in this trajectory, his work rests on multiple genealogies, such as Aimé Césaire's *Discourse on Colonialism* (New York: Monthly Review Press, 2001) and Frantz Fanon's *Black Skin, White Masks* (New York: Grove Press, 1967) and *The Wretched of the Earth* (New York: Grove Press, 1963). Equally important are contributions from Caribbean and Pacific scholars such as Sylvia Wynter, Epeli Hau'ofa, and Linda Tuhiwai Smith.

257. It is broadly agreed that more than 40 million enslaved people were transported across the Atlantic Ocean from Africa to the Americas and the Caribbean to work on plantations, creating an unprecedented, industrial scale carceral system of exploitation.

258. Stephen Haymes, "An Africana Studies Critique of Environmental Ethics" in *Racial Ecologies*, eds. Leilani Nishime and Kim D. Hester Williams (Washington: University of Washington Press, 2018).

↑ Joseph Mallord William Turner, 'Slave Ship (Slavers Throwing Overboard the Dead and Dying, Typhoon Coming On)' oil on canvas, 1840. Courtesy of ErgsArt. Public Domain

The histories of colonialism and current forms of racial ecologies demand a reevaluation of the term "Anthropocene" in order to identify the dynamics that structure this new planetary era. The current framing of the Anthropocene as "humans-in-the-world ... blunts the distinctions between the people, nations, and collectives who drive the fossil-fuel economy and those who do not," writes anthropologist Zoe Todd.[259] The terminology that defines the destruction of future (human and nonhuman) life on Earth needs to recognize the legacy and ongoing damage of colonialism as a cause of the unbalanced and biased distribution of environmental disasters. While adhering to the biased term Anthropocene in the course of our investigations, we are acutely aware of the interventions and the analytical challenges posed to its use by the categories of gender, race, colonialism, and slavery, as expressed by Sylvia Wynter: "The struggle of our new millennium will be one between the ongoing imperative of securing the well-being of our present ethnoclass (i.e., Western bourgeois) conception of the human, Man, which overrepresents itself as if it were the human itself, and that of securing the well-being, and therefore the full cognitive and behavioral autonomy of the human species itself/ourselves."[260]

259. Zoe Todd, "Indigenizing the Anthropocene," see https://law.unimelb.edu.au/__data/assets/pdf_file/0005/3118244/7-Todd,-Zoe,-Indigenizing-the-Anthropocene.pdf

260. Sylvia Wynter, "Unsettling the Coloniality of Being/Power/Truth/Freedom: Toward the Human, After Man, Its Overrepresentation—An Argument," *CR: The New Centennial Review* vol. 3, no. 3 (2003): 257–337.

In the same vein, posthumanist theory and hydrofeminism have contributed to this analysis by challenging a range of conceptual certainties rooted in Enlightenment thinking. Arguing for a different, nature-cultural intertwinement between subject and object and for the multiplicity of possible, porous connections with and understandings of nonhuman entities, posthumanist critique will guide us to reorient our understanding of human agency and humans' interdependency with respect to a world they claim to control. For these reasons and others, we will venture to use the term Anthropocene in its context-specific meanings and remain accountable to the entangled and intersectional politics discussions of the Anthropocene tend to evade.[261]

**Extractive Enclaves on the West African Coast**

The discussion of contemporary extractivism is to be premised by a *longue durée* analysis which recognizes that extractivism is, at its very roots, an economic system installed and practiced by colonial imperialism since the late fifteenth century. Its main impetus is to convert natural resources such as silver, sugar cane, timber, fish, and petroleum into globally tradable commodities. Under this system, all resources are assigned a market value and managed within a market structure, regardless of social and environmental consequences. Colonialism and its afterlives extend to the present day and are aggravated by neoliberal privatization and deregulation processes. Indigenous territories are often still regarded as terra nullius, nobody's land, based on the doctrine of discovery, justifying sovereign claims by states for their occupation and exploitation. The history of extractivism, or extractive capitalism, is motivated by racial capitalism.

The mid-Atlantic trajectory cuts through several gas and oil extraction sites on Africa's West Coast, the historical epicenter of the Atlantic slave trade. Extractive "enclaves" and free trade zones operate along this coastline through a spatially distinctive political economic logic.[262] Often controlled by international companies that provide both capital and technological expertise, state actors, in turn, serve as gatekeepers to extractive territories. Investments are thus "concentrated in secured enclaves,"[263] often to the detriment of coastline communities and wider society.

The discovery of oil in Ghana's territorial waters in 2007 has led to a dispute with the government of Côte d'Ivoire at the International Tribunal on the Law of the Sea (ITLOS) over the position of the maritime border with Ghana. Meanwhile the Ghanaian government has successfully applied to the UN Commission on the Limits of the Continental Shelf (CLCS) to extend the state's seabed resources to the outer edge of the continental shelf. The Jubilee Oil Field is Ghana's first major oil field development, seventy-five kilometers offshore and operated by Tullow Oil. Here oil and gas are extracted by floating production storage and offloading (FPSO) vessels, similar in function to oil platforms, designed to accommodate ultra-deep-water environments. FPSO vessels float on the surface, moored by sets

261. See Judith M. Halberstam and Ira Livingston, eds., *Posthuman Bodies* (Bloomington: Indiana University Press, 1995) for their very early acknowledgements of posthumanism's shortfalls.

262. James Ferguson, "Seeing Like an Oil Company: Space, Security, and Global Capital in Neoliberal Africa," *American Anthropologist*, no. 107 (September 2005): 377–382.

263. Ibid., 378

of chains that hold them in position against ocean currents and weather systems. Surrounded by an extended safety zone of five nautical miles ("Area to be Avoided") and centered on the subsea infrastructure of wells and pipes over 1,000 meters below, the FPSO vessels become a "new artificial island that enables an extension of Ghanaian sovereignty over space in the Exclusive Economic Zone."[264]


→ Offshore Cape Three Points, unknown author, ENI, Creative Commons, under CC BY-NC 2.0 license

The multiplication of such zones, hubs, and corridors on land and water has been driven by the practice architect and theorist Keller Easterling has described as exterritoriality and extrastatecraft. "The spaces of offshore oil, concedes geographer Jon Phillips, are connected to the world around them by transnational governance systems, community engagement programmes, and transnational circulations of capital, standards, norms of governance, knowledge, and information connected both across networked topographical space and in topological space."[265] The territories of offshore extraction produce physical zones over which existing socio-material relations are contested.

**Lekki Free Trade Zone Corridor**

In October 2015, the residents of Okunraiye, a town near the fast-growing city of Lagos, barricaded the entrance to the construction site of a new oil refinery, designed to process about 650,000 barrels of crude oil a day. The protest waged over the breach of a memorandum of understanding between local townships and the Lagos state government, along with the companies operating in the Lekki Free Zone.[266] Twenty-five towns on the Lekki Peninsula form part of the Lekki Free Zone Corridor, approximately 60,000 hectares of land confiscated or forcefully acquired by the state government in 2005, forming the largest free trade zone in West Africa. This

264. Kimberley Peters, Philip Steinberg, and Elaine Stratford, eds., *Territory Beyond Terra* (London: Rowman & Littlefield International Ltd, 2018), 58.

265. Keller Easterling, *Extrastatecraft: The Power of Infrastructure Space* (London and New York: Verso, 2014). 64–65.

266. Jeremiah Ikongio, "The Cultural Protocols of Free Trade", e-flux Architecture, https://www.e-flux.com/architecture/new-silk-roads/313104/the-cultural-protocols-of-free-trade/.

project envisions the transformation of the whole Lekki Peninsula into a global economic zone, including the construction of the Lekki Free Zone, Lagos Free Trade Zone, and the Lekki Deep Seaport (LekkiPort), all currently underway. Along with the Lagos Free Trade Zone, established in 2001 and scheduled to be fully operational by 2022, this project aims to decisively restructure Nigeria's coast. Financed by multinational investors from Singapore and the US along with the Nigerian port authority, Chinese investment is now directed at the Lekki Free Zone, as one of the six pilot zones in Africa.

The Lekki Free Zone is in fact an export product of the Chinese urban model, like the Shenzhen Special Economic Zone. The development of the Lekki Free Zone was initiated by the China Civil Engineering Construction Corporation, which holds a 60 percent majority stake in the Lekki Free Zone Development Company (LFZDC), while the remaining 40 percent is in the hands of the Lagos state government. The creation of special economic zones (SEZs), where liberal laws acting in favor of foreign investment at the expense of labor regulation and the enforcement of environmental laws, is part of a Chinese strategy to establish overseas SEZs to offer "safe havens" for Chinese companies abroad.[267] Dele Balogun, a professor of economics at the University of Lagos, has shared skepticism over the "development" intended by the Lekki Free Zone in a country whose economy is already heavily reliant on imported products: "The zone is aimed at selling products on the local market. That means that it will create appendixes of foreign companies. That's no use to us. We need to turn the system inside out, start producing local products for export."[268]

The large-scale infrastructural projects of the Lekki Free Zone were planned either without consultation with local groups or based on broken promises, resulting in widespread dissatisfaction. Lekki Free Zone is one of several recent examples that reveal how SEZs are decoupled from their reality and how, rather than supporting the domestic economy, they absorb that economy into the enclave. "The zone," Easterling writes, "is often a place of secrets, hyper-control, and segregation. It oscillates constantly between closure and reciprocity as a fortress of sorts that orchestrates a controlled form of cheating. Moreover, as the entrepôt of the world's resources, the zone, despite its attempts to be apolitical, invariably ends up in the cross-hairs of pirates, terrorists, and traffickers of all kinds."[269]

**Capitalocene in the Niger Delta and Ogoniland**

The discovery of oil in the Niger Delta in 1956 had a treacherous impact on Nigeria's economic development. Today, it ranks among the world's ten biggest crude oil exporters. "The inflows of revenues from crude oil exports," writes artist-researcher Jeremiah Ikongio, "resulted in what is called the Dutch Disease, where the increase in economic development in one sector leads to the neglect of others, such as manufacturing and

267. In 2006, the Chinese government announced that it would establish up to fifty overseas economic and trade cooperation zones. Aside from the Lekki Free Zone, there are currently Chinese SEZs in Ethiopia (Eastern Industry Zone) and Mauritius (Mauri-China Freezone Development).

268. Dele Balogun quoted in Michiel Hulshof and Daan Roggeveen, "Non-Lagos", Eflux, January 2018. https://www.e-flux.com/architecture/urban-village/169815/non-lagos/

269. Easterling, *Extrastatecraft*, 67.

agriculture, which were the previous mainstays of Nigeria's economy."[270] The oil economy of Nigeria has created one of the most polluted ecological hotspots in the world. About 40 million liters of oil are spilled every year into the Niger Delta, with devastating effects on residents' health and livelihoods. Vast areas of the area's waterways and mangrove swamps—one of the most diverse ecosystems in Africa—have been destroyed or put at risk. Farmland has been cloaked in oil, contaminating crops and exposing residents to high levels of heavy metals such as chromium, lead, and mercury.

→ Kegbara- dere community oil spill, Ogoniland, Nigeria. Photo: Luka Tomac/ Friends of the Earth International, Under CC BY-SA 2.0 license

The upwelling of nutrients on the coast of West Africa has traditionally made the fishery in the region particularly productive, which was the foundation of local livelihoods and export economies for decades. With large parts of the population relying on fishing and farming, the environmental degradation has risked the survival of many communities. Furthermore, the failure of state authorities to exclude foreign industrial fishing vessels and to control piracy in coastal waters, turned dispossessed fishermen to other means of procurement. "And that's why there's been a lot of upsurge in criminal activities as well as artisan refining, all to survive," attests Udengs Eradiri, the state's commissioner for the environment.[271]

**Ogoniland's Ecological War**

Ogoniland, in the southern Niger Delta, is one of the most polluted places on earth. Hundreds of oil spills, oil well fires, and gas flares occur every year with long-term environmental degradation in one of the largest mangrove ecosystems in the world. The company at the center of this ecocide (the term used to designate the systematic and widespread destruction of ecosystems) is the largest oil operator in the region, Royal Dutch Shell. It maintains a large network of crumbling oil infrastructure and pipelines that crisscross the Ogoni territory, which continues to enrich

270. Ikongio, "The Cultural Protocols of Free Trade."

271. Rebecca Ratcliffe, "'This place used to be green': the brutal impact of oil in the Niger Delta," *The Guardian* (December 6, 2019), https://www.theguardian.com/global-development/2019/dec/06/this-place-used-to-be-green-the-brutal-impact-of-oil-in-the-niger-delta.

the company and the Nigerian state while perpetuating ecological destruction and violations of the Ogoni people's human rights.[272]


→ Clean up the Delta. Break Free from Fossil Fuels. Photo Under CC license.

In 1995, the writer and environmental activist Ken Saro-Wiwa and eight other Ogoni men were executed by General Sani Abacha's military dictatorship for their fight against the devastating environmental degradation of the Niger Delta by Shell and other multinational companies. Saro-Wiwa launched what he called an "ecological war" by founding and directing the Movement for Survival of the Ogoni People (MOSOP), a nonviolent social movement for the rights of the indigenous Ogoni people of Central Niger Delta. MOSOP currently represents more than 500,000 people of Ogoni whose lives continue to be affected by the disastrous environmental conditions created by oil extraction in the Niger Delta. Research has found that in one community, the water contains 900 times the World Health Organization accepted level of benzene, a highly carcinogenic matter that occurs naturally in crude petroleum. INTERPRT, an investigative research platform commissioned by TBA21–Academy and initiated by Nabil Ahmed has been working since 2019 on behalf of MOSOP to gather spatial evidence of the impact of long-term oil pollution on the southern Niger Delta in order to put forth a climate-justice case against Shell for ecocidal violations. While Shell's environmental record in Nigeria and big oil's global impact on climate change are both well known, the project aims to bring these narratives together as a body of evidence of twenty-first-century climate crimes.

In 2016, the Nigerian government invited the United Nations Environment Programme (UNEP) to assess the environment and public health impacts of oil contamination in Ogoniland and the Niger Delta. A 2017 UNEP report shows that the pollution from fifty-plus years of oil operations in the

272. Nabil Ahmed, "Resisting the Shell State," forthcoming publication on e-flux Architecture as part of *Oceans in Transformation*, by Territorial Agency and commissioned by TBA21–Academy (June 2020).

region has penetrated further and deeper than many may have suspected.[273] Some key findings indicate that areas that appear unaffected at the surface are in reality severely contaminated underground and include proof of drinking water contaminated with high levels of hydrocarbons in at least ten Ogoni communities and an 8-centimeter layer of refined oil, linked to an oil spill which took place several years prior, floating on the groundwater which serves the wells.

↑ Aerial view of an oil spill in Bodo. 2010. Photo: UNEP.

A UNDP report states that there has been a total of 6,817 oil spills in the Niger Delta between 1976 and 2001, and that the clean-up would take thirty years and cost $ 1 billion, with Ogoniland being the most impacted region.[274] Despite the evident disastrous consequences for human health and wildlife, no justice has been offered with respect to the committed crimes. Shell, the largest corporation operating in the area, has defended the scale of pollution by claiming that the vast majority of oil spills are caused by sabotage and theft of oil, a claim with no legitimate basis and which "relies on the outcome of an oil spill investigation process—commonly known as the Joint Investigation Visit or JIV process—in which the companies themselves are the primary investigators," as reported by Amnesty International a year after the

273. Over a fourteen month period, the UNEP team examined more than 200 locations, surveyed 122 kilometers of pipelines, reviewed more than 5,000 medical records and engaged over 23,000 people at local community meetings. Detailed soil and groundwater contamination investigations were conducted at sixty-nine sites, which ranged in size from 1,300 square meters (Barabeedom-K.dere, Gokana local government area [LGA]) to 79 hectares (Ajeokpori-Akpajo, Eleme LGA).

274. United Nations Environment Programme report: "Environmental Assessment of Ogoniland," published 2011.

release of the initial UNEP report.[275] The Ogoni oil fields are now closed, but some of the flow stations and manifolds are still in operation through poorly maintained pipelines that crisscross the Ogoni territory and that have now trapped the Ogoni people in the Niger Delta in a what Ahmed had described as "infrastructure snare."[276]

**Depletion of West African Fisheries**

In 2017, Global Fishing Watch released the very first global report on transshipment, which analyzed over 21 billion positional Automatic Identification System (AIS) messages from ocean-going vessels between 2012 and July 2017, identifying and tracking 641 vessels with refrigerated cargo holds capable of transshipping at sea and transporting fish. The report shows that transshipment is very common in West African Exclusive Economic Zones (where 9 percent of the global transshipment patterns are believed to take place). As these events usually take place outside EEZs, in the case of West African EEZs, transshipment events could be due to a combination of limited monitoring and enforcement. The research has observed that vessels turn off their Automatic Identification System—a mandatory collision-avoidance system that is used to transmit their position, identity, and speed—to stay "under the radar" in some areas of significant transshipment near the coast of West Africa.[277]

The collected data shows that transshipment is associable to other patterns of illegal, unreported, or unregulated (IUU) fishing, which is heavily implicated in overfishing. A fifth of the world's fisheries catch may originate from IUU activity, linking consumers in Europe, the United States, and Asia with a practice that is fueling a global tragedy that is leading to the overexploitation of a common resource. Current rates of extraction are driving several species toward extinction while jeopardizing the livelihoods of artisanal fishing communities across a broad group of West African countries, including Senegal, Ghana, Sierra Leone, Liberia, and Mauritania.[278] West African waters are estimated to have the highest levels of IUU fishing in the world, representing up to 37 percent of the region's catch.[279]

Overfishing is primarily caused by foreign trawlers from Asia and Europe, whose extractive activities have cost West African countries 300,000 jobs and $ 2 billion in income.[280] Between 1985 and 2013, China, the country most present in African fisheries, expanded its fishing operations from thirteen to 462 vessels. In 2015, Greenpeace denounced the

275. For more information on the deficiencies and abuses of the JIV process, see Amnesty international report: "Bad Information: oil spill investigations in the Niger delta," https://www.amnesty.org/download/Documents/12000/afr440282013en.pdf.

276. Ahmed, "Resisting the Shell State."

277. Global Fishing Watch report: "The Global View of Transshipment: Revised preliminary findings" (2017).

278. Alfonso Daniels, Miren Gutiérrez, Gonzalo Fanjul, Arantxa Guereña, Ishbel Matheson and Kevin Watkins, "Western Africa's Missing Fish: The impacts of illegal, unreported and unregulated fishing and under-reporting catches by foreign fleets," Overseas Development Institute (2016), https://www.odi.org/sites/odi.org.uk/files/resource-documents/10665.pdf.

279. Environmental Justice Foundation report: "Pirate Fishing Exposed: The Fight Against Illegal Fishing in West Africa and the EU (2012), http://ejfoundation.org/sites/default/files/public/Pirate%20Fishing%20Exposed.pdf.

280. John Hocevar, quoted in Salem Solomon, "Chinese Overfishing Threatens West African Economies", *VOA News* (July 17, 2017).

illegal, unreported, and recorded fishing practices by Chinese vessels occurring in waters off Senegal, Guinea, Guinea-Bissau, and Ghana.

There is enough evidence to suggest that Africa has become a hotspot for illegal fishing by foreign fleets within the last decade. According Global Fishing Watch, industrial trawlers are operating unlawfully in inshore waters reserved for small scale "artisanal" fishers.[281] The findings shows that about 93% of industrial fishing in Somalia between 2012 and 2016 occurred in banned areas and that industrial trawlers in these spaces were flying flags from South Korea, EU countries (Greece and Spain) and China. According to the African Center for Strategic Studies, the majority of Africans live along the coast with a sea-based culture going back millennia. About half a billion Africans rely on fish for their protein intake.[282] The FAO profile on Sierra Leone for example indicates that the country is losing an estimated USD 29 million every year to IUU fishing. The activities of illegal fishing vessels engaging in unsustainable fishing practices lead to stock depletion and unemployment to local fishers who are being forced out of water. This could compromise livelihood and future food security.[283] To address this situation, policy makers need to step up and develop policies that favor and protect indigenous coastal communities from the growing competition with international fishers carrying out illegal fishing in African waters. Furthermore, there is need to develop policies protecting coastal communities from competition with multinational companies and international corporations investing on tourism along the African coast.

Text by Nchongayi Christantus Begealawuh and Daniela Zyman

**Piracy in the Gulf of Guinea**

The Gulf of Guinea, the coastal zone stretching from Senegal to Angola, is particularly vulnerable to piracy because of its geopolitical and geoeconomic importance for the transport of goods from landlocked central and southern Africa. Safe passage to ports in the region and security within its waters are vital for global energy production, for West Africa's fishing industry, and for the prevention of the trafficking of narcotics, people, and weapons.[284] Although piracy is only recognized as such when occurring in the high seas,[285] pirates and hijackers operate primarily in national waters and often conduct attacks in one state's territorial waters only to then flee

281. Tood Woody (2020, February, 11). How AI is identifying illegal trawlers in Africa. https://chinadialogueocean.net/13072-how-ai-is-identifying-illegal-trawlers-in-africa/

282. Assis Malaquias (2017). Maritime Security in the Western Indian Ocean https://africa-center.org/spotlight/maritime-security-western-indian-ocean-a-discussion-with-assis-malaquias/

283. Diouf, J., & Sheeran, J. (2010). The State of Food Insecurity in the World: Addressing food insecurity in protracted crises. *World Food Program (WFP) and Food and Agriculture Organization of the United Nations (FAO) Joint Report*.

284. According to the UN Office of Drugs and Crime, narcotics worth a total of $ 2 billion transit annually through West Africa. West Africa Coast Initiative, UNDOC, 2013, http://www.unodc.org/westandcentralafrica/en/west-africa-coast-initiative.html.

285. Attacks occurring in national waters are categorized as armed robbery and not piracy. According to article 101 of the UNCLOS, piracy consists of any illegal acts of violence or detention, or any act of depredation, committed for private ends by the crew or the passengers of a private ship or a private aircraft, and directed: (i) on the high seas, against another ship or aircraft, or against persons or property on board such ship or aircraft; (ii) against a ship, aircraft, persons or property in a place outside the jurisdiction of any state.

to another state's jurisdiction.[286] Non-local organizations that have encouraged cooperation among the coastal states of the Gulf of Guinea have failed to recognize that the maritime boundaries in the Gulf are often not properly delineated, making cooperation between governments and their navies difficult.[287]

As an important transitory route for the African energy trade, with intensive oil extraction in Angola and the Niger Delta, West African waters have seen a rise in organized crime in the form of petro-piracy, aimed at diverting crude-oil from tankers so as to process the gains in illegally set up refineries or selling the cargo in the black market.[288] Unlike the waters of the Horn of Africa which have also seen a rise in piracy activity, mainly involving hijacking ships for ransom, powerful international navies are not constantly patrolling the Gulf of Guinea, which is safeguarded only by regional navies.[289] In spite of attempts to enhance the capacity of these regional navies, the number of piracy incidents in 2017 stayed at the same elevated level as in 2016 and almost doubled since 2015, according to the latest available Oceans Beyond Piracy report.[290] Moreover, the report also identified a proliferation of at-anchor attacks along the West African coast, with incidents in Freetown, Conakry, Praia, and especially the Port of Cotonou in Benin, which remains a central target. As traffic in the port grew significantly over the past few years (with a 30 percent increase in cargo handling from 2012 to 2017), due to the overall growth in African maritime trade, the port has been more vulnerable to attacks, meaning that pirates are following the evolution of merchant traffic routes and moving their operations to the places where capital accumulates.

This trajectory uses the Anti-Shipping Activity Messages (ASAM) Piracy Database to compare piracy events in West Africa with transshipment activity revealed by the Global Fishing Watch. The ASAM database aggregates forty years of piracy incidents sourced by the National Geospatial-Intelligence Agency and lists the locations and descriptive accounts of specific hostile acts against ships at sea.

**Greening Sahara**

Each year, atmospheric aerosols are transported from the Sahara Desert to the Amazon rainforest via the trade winds that cross the Atlantic along the earth's equatorial region. The process fertilizes the Atlantic Ocean

286. Stephen Starr, "Maritime Piracy on the Rise in West Africa," *Combating Terrorism Center* vol. 7, issue 4 (April 2017).

287. Daniel J. Dzurek, "Gulf of Guinea Boundary Disputes," *IBRU Boundary and Security Bulletin* (Spring 1999): 98–104.

288. World Economic Forum on Africa, "West Africa is becoming the world's piracy capital. Here's how to tackle the problem," https://www.weforum.org/agenda/2019/06/west-africa-is-becoming-the-world-s-piracy-capital-here-s-how-to-tackle-the-problem/.

289. It should be noted that apart from pirates' intent, the nature of the governments in the Gulf of Aden and the Gulf of Guinea are different and cannot be overlooked in explaining the differences in piracy. For example, Somalia's "statelessness" and fragility, compared to the relatively stability of governments and port policing in the West, are key differences in explaining why ships are more likely to be targeted for ransom in the East.

290. Maisie Pigeon, Emina Sadic, Sean Duncan, Chuck Ridgway, Kelsey Soeth, "The State of Maritime Piracy 2017: Assessing the economic and human cost," One Earth Future Report (2018), http://oceansbeyondpiracy.org/sites/default/files/one_earth_future_state_of_piracy_report_2017.pdf.

and the Amazon rainforest by adding phosphorous to the soil. An average of 182 million tons of dust leave the Sahara each year, about 27 million tons of which reach the Amazon basin. The changing levels of this nutrient-rich dust are closely associated with changes in rainfall in the Sahel, the semi-arid land south of the Sahara. When the Sahel is dry, more dust reaches the Amazon the following year, and vice versa.[291] This trajectory reveals the concentration of atmospheric aerosols by using data collected by the Copernicus Sentinel-5 Precursor, a satellite launched by the European Space Agency's in 2017. Sentinel-5P is equipped with the TROPOspheric Monitoring Instrument (TROPOMI), which monitors air quality by mapping a multitude of trace gases such as nitrogen dioxide, ozone, formaldehyde, sulfur dioxide, methane, carbon monoxide, and aerosols in the atmosphere.[292]

The transatlantic transfer of aerosols is a vital component of the earth system and it is quickly being modified by global warming: the greening of the desert in Africa is triggering transformations thousands of miles away and is coupled with deforestation in the Amazon. In most recent decades, seasonal rainfall amounts in the Sahel have partially recovered from the severe period of droughts between the 1970s and the 1990s. The warming of the equator is causing an increase in temperature in the mid-Atlantic, increasingly pushing warm and humid air into the African tropical forests.[293] The increasing rainfall causes an expansion of the green areas, pushing the Sahel north. The future projection of the West African monsoon, the primary cause of rainfall in the Sahel, exhibits warming over the entire domain, decreasing precipitation over the southern Sahel, and increase of precipitation over the western Sahara.[294] The agriculture-based economy of the region relies on the West African monsoon. The greening of the Sahara caused by this shifting wind system creates more possibilities for exploitation of the land in West Africa, leading the coastal communities in West Africa to move inland. The variability and change of the West African monsoon can have a devastating impact on the local population, especially since the region lacks sufficient irrigation infrastructure.

**Forest Fires**

This trajectory uses global wildfires data from the Fire Information for Resource Management System (FIRMS) generated by NASA's Moderate Resolution Imaging Spectroradiometer (MODIS) and NASA's Visible

291. Hongbin Yu, Mian Chin, et al., "The fertilizing role of African dust in the Amazon rainforest: A first multiyear assessment based on data from Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations", in *Geospatial Research Letters*, Vol. 42, Issue 6, March 2015. https://agupubs.onlinelibrary.wiley.com/doi/epdf/10.1002/2015GL063040

292. European Space Agency. "Sentinel 5P" https://sentinel.esa.int/web/sentinel/missions/sentinel-5p

293. Research has found that "the variability of rainfall in the Sahel results from the response of the African summer monsoon to oceanic forcing, amplified by land-atmosphere interaction" meaning that the drying trends in the semi-arid Sahel have thus been "attributed to the warmer-than-average low-latitude waters around Africa, which, by favoring the establishment of deep convection over the ocean, weaken the continental convergence associated with the monsoon and engender widespread drought from Senegal to Ethiopia." See A. Giannini et. al "Oceanic Forcing of Sahel Rainfall on Interannual to Interdecadal Time Scales" in Science, 2003.

294. Jerry Raj, Hamza Kunhu Bangalath, and Georgiy Stenchikov, "West African Monsoon: current state and future projections in a high-resolution AGCM," *Climate Dynamics* vol. 52 (November 2018).

Infrared Imaging Radiometer Suite (VIIRS). The data shows that the center of the African continent and the northern parts of the Amazon have a dense concentration of wildfire hotspots.[295] Wildfires are not only an environmental tragedy in terms of forest and biodiversity loss, they also entail massive releases of the carbon dioxide that was once stored in the biomass of the forests into the atmosphere. This is also evidenced by the air quality data collected by the European Space Agency's Sentinel-5P, which has recorded drastic increases in carbon monoxide in 2018–19.

Scientists from the University of Maryland, which provides the data set on forest loss that is constitutive to the infographics of this trajectory ("Global Forest Change 2000–2014"), recorded the loss of carbon due to forest degradation in areas exposed to logging and fire damage in an area of 7,500 square miles of the southeast Amazon known as the "arc of deforestation." Comparing the impacts of fire and logging, the research has found that fires not only caused higher losses of stored carbon than logging, but that fire-damaged forests also take a longer time to recover. While degradation, unlike deforestation, is not absolute, it entails a slower process of death stretched over a longer term, causing a more insidious dislocation of the consensual baseline of environmental standards.


→ Banner of Indigenous People Through Europe's campaign 'Indigenous blood: Not a single drop more.' Unknown author, under CC licence.

Amazon fires are partly accidental and seasonal, but the rates and overall reach and number of fires have increased dramatically in the past decades, reflecting a shift toward a pro-deforestation policy in the Amazon. Most fires are intentionally caused by developers to clear land and make way for agribusiness such as cattle ranches and palm oil plantations. As reported by Brazilian indigenous leader Sônia Guajajara, some of these fires are directly aimed at burning indigenous territories as a threat. The loss of the immense oxygen production in the Amazon, the "earth's lungs," may cause irreparable damages to global climate, but it is already destroying the lives of hundreds of unique and diverse Indigenous communities. Brazil, where most of these communities reside, has laws aimed at protecting these peoples but these are currently being overturned by President Jair Bolsonaro. On multiple occasions, Bolsonaro has expressed open disdain

295. See FIRMS Global Wildfire Map, https://firms.modaps.eosdis.nasa.gov/map.

for these communities, who stand in the way of extractive plans in the Amazon. It is no exaggeration to state that Amerindian peoples are facing genocide under Bolsonaro's administration.

**Impact of Extractivism on Frontline Communities and Indigenous Peoples in Brazil: The Cases of the Amazon Sacred Headwaters and Brumadinho**

The Napo, Pastaza, and Marañon River Basins in Ecuador and Peru form an area referred to as the Sacred Headwaters of the Amazon.[296] Spanning 30 million hectares, this area is home to nearly 500,000 indigenous people. The reason this rainforest region remains largely free of industrial extraction is due to the successful efforts of indigenous communities to protect and defend their territories. They have stopped industrial waterways, dams, roads, and drilling plans by companies including Chevron, ConocoPhillips, ARCO, Andes Petroleum, ENI, Petrobras, CGC, and Talisman Energy, among others. Their efforts have stopped extraction and bolstered indigenous rights throughout the region and beyond. From their communities in the rainforest to the streets of the capital cities of Quito and Lima, or in dialogue with state governments, indigenous peoples in the Sacred Headwaters region continue to adamantly express their opposition to any new oil drilling.

However, decades of oil extraction in the western Amazon have devastated the forest, decimated indigenous peoples, and left a toxic legacy in the river. Between 1964 and 1990, Texaco—which merged with Chevron in 2001—deliberately dumped more than 16 billion gallons of toxic wastewater, spilled roughly 17 million gallons of crude oil, and left hazardous waste in hundreds of open pits dug out of the forest floor in the Ecuadorian Amazon. To save money—about $ 3 per barrel—the company chose to use environmental practices that were obsolete, did not meet industry standards, and were illegal in Ecuador and the United States. The result was, and continues to be, one of the worst environmental disasters on the planet. The contamination of soil, groundwater, and surface streams has caused local indigenous and *campesino* people to suffer a wave of mouth, stomach, and uterine cancer as well as birth defects and spontaneous miscarriages. Cancer rates in this region are as high as five times the national average in Ecuador. Chevron never cleaned up the mess it inherited, and these oil wastes continue to poison the rainforest ecosystem.[297]

In Brumadinho, a region in southeast Brazil, the collapse of a tailing dam from an iron ore mine in 2019 released almost 13 million cubic meters of mining waste, creating a toxic sludge that swept the region and contaminated the Paraopeba River with toxic waste. The indigenous Pataxó Hã-hã-hãe people are among the communities affected by the disaster as the river that passed the village Naô Xohã provided a primary source of nutrition and bathing. The dam was operated by Vale, one of the world's biggest mining companies, which was responsible for a similar catastrophe in 2015, when a mining dam collapsed in Mariana, Brazil. Two mining dams

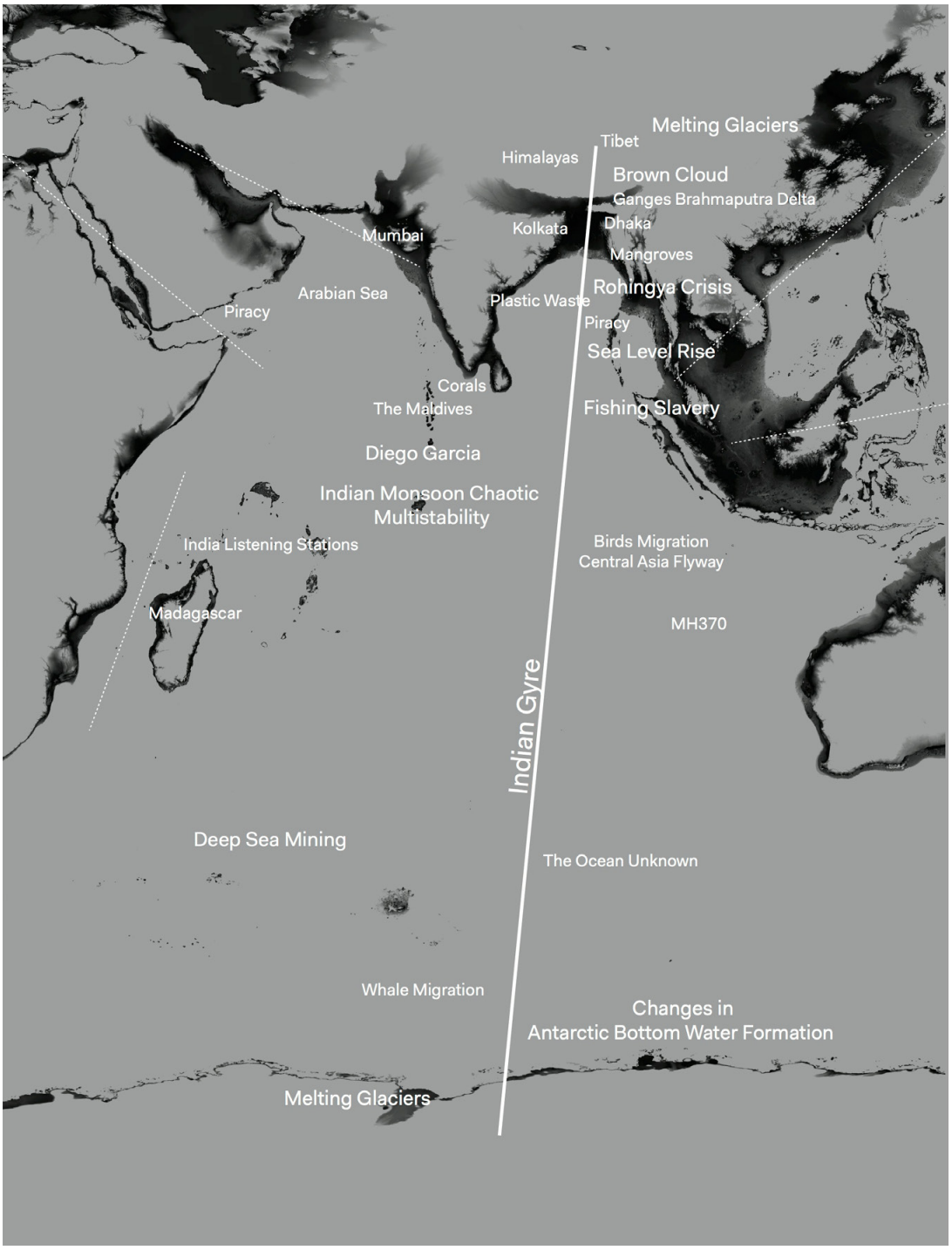
296. Kevin Koenig et al., "The Amazon Sacred Headwaters: Indigenous Rainforest 'Territories for Life' Under Threat," (2019), https://amazonwatch.org/assets/files/2019-12-amazon-sacred-headwaters-report.pdf.

297. Ibid.

holding millions of cubic meters of mining waste collapsed, giving way to one of the worst environmental disasters in Brazilian history, killing twenty people and affecting biodiversity across hundreds of kilometers of the Doce River, the riparian lands surrounding it, and the Atlantic coast at its mouth. The mud contaminated with arsenic, lead, chromium, and a variety of other heavy metals flowed through the Doce, the largest river in southeast Brazil, affecting thousands of lives and particularly the indigenous Krenak people.[298]

298. See Isabelle Carbonell's documentary *The River Runs Red* (2019), https://www.izaca.com; Letícia Couto Garcia et al., "Brazil's Worst Mining Disaster: Corporations must be compelled to pay the actual environmental costs," *Ecological Applications* vol. 27, no. 1 (October 2016); Mariana Campos, "Their livelihood depended on the river, but its waters are now toxic mud" Greenpeace International (February 1, 2019), https://www.greenpeace.org/international/story/20647/their-livelihood-depended-on-the-river-but-its-waters-are-now-toxic-mud/; and Bruno Weis "Dam collapse in Brazil destroys towns and turns river into muddy wasteland," Greenpeace International (November 17, 2015), https://www.greenpeace.org.au/blog/dam-collapse-in-brazil-destroys-towns-and-turns-river-into-muddy-wasteland/.

# 5. INDIAN OCEAN GYRE




**Geographical Areas covered**

**Tibetan Plateau; Third Pole of the Himalaya; Bangladesh; Rohingya refugees; Bay of Bengal; Sri Lanka; MH370; Heard Island; Antarctica.**

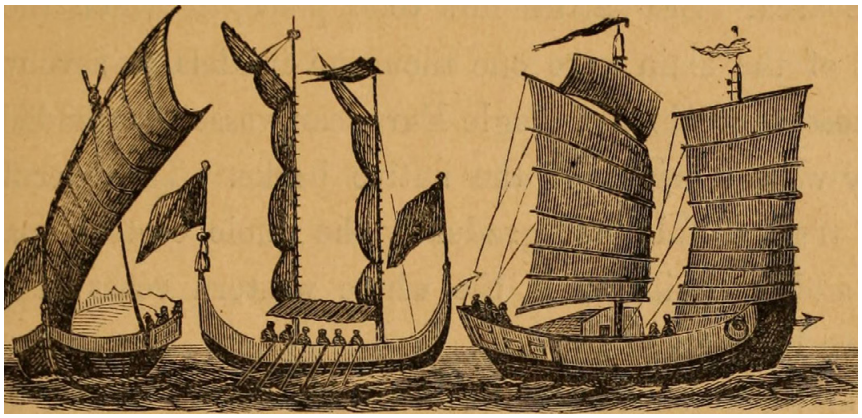
The Indian Ocean, one of the most sensitive ecosystems in the world, is the least explored ocean of the planet. It is the warmest ocean and one of the most sensitive ecosystems in the world. It is the only ocean in which currents and winds reverse direction during the year in a system known as monsoons, bringing rainy and dry seasons to distant but connected geographies. As pollutants from the Northern Hemisphere are transported to the clear air of the Southern Hemisphere, the ecologies of the Indian Ocean make it a unique natural laboratory for studying the impact of anthropogenic aerosols on the climate.

From the melting Tibetan plateau, which scientists sometimes refer to as the “third pole” which holds the Hindu Kush Himalaya ice sheet to the changes in deep-water formation in the Southern Ocean, this trajectory charts transformations in the rapidly changing ocean. The rising sea levels and the increased water in the Himalaya rivers are linked to rapid urbanization on the deltas of the Bay of Bengal and to agricultural intensification under the government-led Green Revolution, propagated as the solution to feeding the growing populations of the region.

The construction of the southern components of the global supply infrastructure linking China to the world (Belt and Road Initiative) is quickly modifying the relations between powers. The rise of global infrastructures and the shifting geopolitical relations are inscribed in the materiality of the Indian Ocean: the brown clouds of rapid urbanization of India.

### The Indian Ocean Contact Zone

Before the rise of steam power, the rhythm of travel and trade across the Indian Ocean was defined by the winds of the Indian monsoon, blowing from the northeast between November and April and from the northwest from June to October. The predictable meteorological pattern, paired with the longed-for resources indigenous to the region, have made the Indian Ocean the world's oldest transcontinental seafaring trading system. These trade networks connecting China, Indonesia, the Indian subcontinent, the Arabian Peninsula, and East and South Africa were further consolidated and promoted by the spread of Islam in the Indian Ocean from the eighth century onward, which contributed to the establishment of an interconnected network of cosmopolitan port cities such as Kilwa, Mombasa, Malindi, Mogadishu, Jeddah, Aden, Muscat, Cambay, and Calicut. For thousands of years, the Indian Ocean has been a space of multiethnic encounters and clashing ideologies—Pan Islam, Pan Buddhism, Hindu Reformism, Judaism, Theosophy, Chinese and Western Imperialism, Non-Alignment movements—a complex history that, in the words of postcolonial scholar Isabel Hofmeyr, "complicates binaries, moving us away from the simplicities of the resistant local and the dominating global and toward a historically deep archive of competing universalisms."[299]



→ Image from 'Man upon the sea: or, a history of maritime adventure, exploration, and discovery, from the earliest ages to the present time ...', Frank B. Goodrich, 1858, p. 214. Internet Archive Book Images. Under CC license.

Long before the arrival of armed European merchants in this fervent multiethnic trade system, technologies of navigation such as the Chinese compass; the Dhow ships with triangular sails that allowed sailors from Persia, India, the Arabian Peninsula, and East Africa to sail upwind; Zheng He's treasure fleet; and the Islamic astrolabe used to determined latitude where being developed among other crucial inventions.[300] Unsurprisingly, the prosperity of the Indian Ocean world attracted the attention of European merchants, the first of whom were the Portuguese who sought a sea route around Africa in 1498 when Vasco da Gama sailed with the help of an Indian pilot from East Africa to Calicut in Kerala, India. From then on, Portuguese, Dutch, English, French, and Danish merchants sailed the water of Indian Ocean in search of prized resources such as pepper, cotton, and porcelain, but also establishing plantation systems and enslaving African and Asian people. The trade systems predating the European arrival, led by people

299. Isabel Hofmeyr, "Universalizing the Indian Ocean," *Publications of the Modern Language Association of America* vol. 125, no. 3 (May 2010): 721–729.

300. See Leila Tarazi Fawaz and C. A. Bayly, eds., *Modernity and Culture: From the Mediterranean to the Indian Ocean*, (New York: Columbia University Press, 2002), in which the authors demonstrate how forms of cosmopolitan modernity have emerged through the interaction of Middle Eastern and South Asian societies.

such as the diasporic Hadhrami people, were based on nonviolent regional arrangements, the Europeans traded through militarization and sovereign extensions.[301] As Amitav Ghosh reminds us in the poignant study *The Great Derangement*, the origins of global heating are linked inextricably with the histories of capitalism as well as (ecological) imperialism and colonialism. The "derangement" he discusses is foremost an epistemological crisis born at the same time as the "accumulation of carbon in the atmosphere was rewriting the destiny of the earth."[302]

The infrastructural legacy of trade and colonization across the Indian Ocean World from Cape Town to Sri Lanka,[303] has led architecture researcher Lindsay Bremner to think of it as a symmetrically "folded ocean," which, taking the island Diego Garcia as its central axis, mirrors prominent coastal cities such as Dubai and Kolkata along the Tropic of Cancer, Mogadishu and Singapore along the Equator, and Durban and Perth along the Tropic of Capricorn. This proposed geography of the folded ocean is part of a long tradition of academic analysis that has taken the Indian Ocean as a unique perspective from which to consider the longevity of South-to-South relations, such as competitive Sino-Indian powers, or the continuity of Asian and African exchanges. Whereas the trajectory charted by Territorial Agency takes a valuable and unconventional North to South angle of investigation into the maritime region to understand its changing ecologies and to connect two major components of the Earth's cryosphere, the "third pole" of the Tibetan plateau and the ice sheet of Antarctica, a perspective that recognizes the historical depth of the East to West relations (and vice versa) in the Indian Ocean cannot be overlooked. The depth of these historical relations reorients the Western idea of globalization and recognizes the changing world order imposed by the emergence of new economic superpowers and their place in the global supply infrastructure.

The Indian Ocean's seabed contains large reserves of hydrocarbons in the offshore areas of Western Australia, India, Iran, and Saudi Arabia. In fact, an estimated 40 percent of the world's offshore oil production comes from the seabed of the Indian Ocean and as the major sea route connecting the oil fields of the Persian Gulf and Asia, it carries a particularly heavy traffic of petroleum. For China, the Indian Ocean represents the main maritime waterway of the Belt and Road Initiative and a connection to African Indian Ocean Rim countries, which it is developing a growing economic influence on. China's objectives have been confirmed by huge investments from Chinese companies in several Indian Ocean ports, including Gwadar, Hambantota, Colombo, and Sonadia. As these commercial interests come hand in hand with militarization, the growing Chinese involvement is raising concerns from both American and other Asian powers, such as India, that squabble for control over shipping lanes and oil supplies and for dominance of African markets and minerals. In recent years, India has strengthened its

301. Engseng Ho, "Empires through Diasporic Eyes: A view from the Other Boat," *Comparative Study of Society and History* vol. 46, no.1 (2004): 210–246.

302. Amitav Ghosh, *The Great Derangement: Climate Change and the Unthinkable* (Chicago: University of Chicago Press, 2017), 7.

303. This can be exemplified by the seventeenth-century forts built by the Dutch East India Company on the cliffs in Galle, Sri Lanka, and Cape Town, mirroring one another across the ocean. See Miki Flockemann, "Is it the Same Sea as Back Home?: Transformative Complicities as traveling tropes in fictions from Sri Lanka, Mauritius, and South Africa," *Indian Ocean Studies: Cultural, Social, and Political Perspectives*, Shanti Moorthy and Ashraf Jamal, eds. (New York and London: Routledge, 2010), 281 and 293.

involvement in those regions and improved its relations with its countries, notably Mauritius, the Seychelles, Madagascar, and coastal states such as Mozambique, Kenya, and Tanzania.[304]

**The Dutch East India Company**

From a European perspective, the history of the Indian Ocean is closely linked to the Atlantic continents by a global maritime system whose central player was, for nearly three centuries, an almighty Dutch trading conglomerate. Prior to the establishment of the Dutch East India Company in 1602—formally known as the United East India Company or *Vereenigde Oostindische Compagnie* (VOC)—the Dutch expansion in Southeast Asia was first characterized by a series of independent expeditions and individual traders who reached the "far East" ocean to engage with the fabled and prosperous intercontinental spice trade. In 1602, these rival traders were united to one enterprise by the Dutch republican statesman Johan van Oldenbarnevelt to form a chartered coalition under the name United East India Company. The newly formed VOC expanded its activities throughout most of the seventeenth century as the main instrument of the Dutch commercial empire in the East Indies (present-day Indonesia) until its dissolution in 1799.

→ Hendrik van Schuylenburgh, 'The Trading Post of the Dutch East India Company in Hooghly,' oil on canvas, 1665. Public Domain.

The VOC was more than a commercial enterprise. It should be considered as a political institution. From its inception, the VOC's role as a state-owned company was to become an instrument of war in the Dutch Republic's revolutionary struggle against the Spanish Empire's rule over the Netherlands. To this end, the chartered company was granted a national monopoly on trade, but also the ability to train its own army, to negotiate and declare war, to strike its own coins, to occupy land, and to enforce slavery. Its financial backing has laid down the path for the cornerstone of modern capitalism: to meet the large amount of capital required by its imperialist objectives, the VOC established a trading house in the center of

304. Alex Vines and Bereni Oruitemeka, "India's Engagement with the African Indian Ocean Rim States" Africa Programme Paper: AFP P 1/08 (April 2008), https://www.chathamhouse.org/sites/default/files/public/Research/Africa/india_africa0408.pdf.

Amsterdam, where shares of the company where publicly sold. Raising over six million guilders, the VOC is widely perceived to have established the first stock market financing of a publicly traded company in Western history.

The enterprise's territorial objectives over East India were justified by the innovative principles written in *Mare Liberum* (The Free Sea), a treatise commissioned by the VOC and published in 1609 by Dutch jurist and philosopher Hugo Grotius. In the book, Grotius formulated the principle that the sea was international territory and all nations were free to use it for seafaring trade.[305] This is specifically directed against the Portuguese and Spanish *Mare Clausum* policy and their claim of monopoly on East Indian trade. Grotius's treatise was triggered by the capture of the Portuguese merchant ship *Santa Catarina*, which was seized and looted by the VOC in 1603, occasioning international outrage. The scandalous act led to a public judicial hearing and a wider campaign in defense of the freedom of the seas principles, providing the ideological justification for the breaking up of Portuguese trade monopolies formed by the country's formidable naval power.


→ Mare liberum, 1633, from Hugo Grotius Mari libero et P. Merula De maribus (Lugd. Batavorum: Ex officina Elzeviriana, 1633), Photo: Yale Law Library

In 1619, the VOC began its territorial expansion in Southeast Asia by the annexation of Jayakarta (present-day Jakarta) on the island of Java. Following the self-granted rights of its charter, the VOC invaded the port town by annihilating its indigenous inhabitants and grabbing land. Jayakarta was then renamed Batavia after the Batavi Germanic tribe, which inhabited the Netherlands region during Roman times, and whom the Dutch came to regard as their ancestors during the country's struggle for independence

305. Grotius argued for a principle of free sea by associating water with air: "The air belongs to this class of things for two reasons. First, it is not susceptible of occupation; and second its common use is destined for all men. For the same reasons the sea is common to all, because it is so limitless that it cannot become a possession of any one, and because it is adapted for the use of all, whether we consider it from the point of view of navigation or of fisheries."

from Spain. Batavia soon became the new urbanized headquarters of the VOC's trading network in Asia, both as a meeting point for fleets and a prominent agricultural center where cash crops proliferated.

The forced relocation of people and labor played an important role in maintaining the imperial order of the proto-industrial and militarized empire that was the VOC. This included European workers relocated to Southeast Asia to work as sailors and soldiers, but more crucially, the enslavement and shipping of Africans, Indians, and Asians to Batavia and to the locations of commercial that followed, such as Malacca (Melaka), the VOC's spice plantations in the Moluccas (Malukus) in eastern Indonesia, and its settlements in coastal Ceylon (Sri Lanka) and the Dutch-controlled Cape of Good Hope.[306] Dutch slave and indentured trade in the Indian Ocean was linked to the British, French, and Portuguese transcontinental trades, along with indigenous slave trading in the Indian Ocean Basin and only slightly smaller in volume than the trans-Saharan slave trade and larger than the size of the Swahili, Red Sea, and Dutch West India Company trades, equaling 15 to 30 percent of the total trans-Atlantic trade.[307] Whereas the Atlantic slave trade has been mapped out in relatively great detail, its Indian Ocean counterpart has remained largely uncharted and overlooked in Asian colonial historiography.

**The Melting Third Pole**

Glaciologists refer to the Tibetan plateau, home to the vast Hindu Kush Himalaya ice sheet, as the "third pole" because it contains the largest amount of snow and ice after the Arctic and the Antarctic regions. The Himalaya ice sheet is the source of the ten major river systems that provide irrigation, power, and drinking water for over 1.3 billion people in Asia—nearly 20 percent of the world's population. The 2019 IPCC Special Report on the Oceans and Cryosphere in a Changing Climate warns that up to two-thirds of the region's remaining glaciers are on track to disappear by the end of the century.[308]

Because of its elevation, the Tibetan plateau absorbs energy from rising, warm, and moisture-laden air, causing it to warm at a rate up to three times faster than the global average. According to the 2019 Hindu Kush Himalaya Assessment report compiled by more than 200 scientists for Kathmandu-based International Centre for Integrated Mountain Development (ICIMOD), even if average global temperature rise stays below 1.5 degrees Celsius, the region will experience a warming of more than 2 degrees, and if emissions are not reduced, the rise will be of 5 degrees.[309]

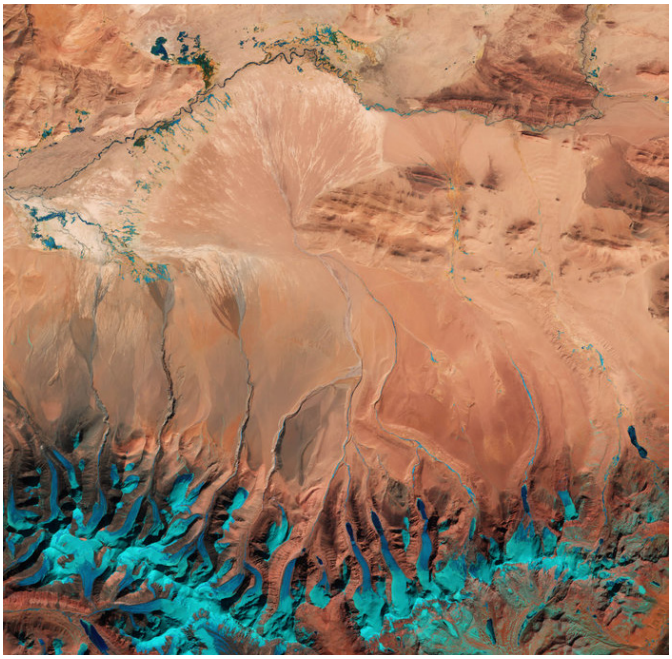
306. Markus Vink, "'The World's Oldest Trade': Dutch Slavery and Slave Trade in the Indian Ocean in the Seventeenth Century," *Journal of World History* vol. 14, no. 2 (June 2003): 133–177.

307. Ibid., 168.

308. IPCC Special Report on the Ocean and Cryosphere in a Changing Climate, 2019

309. Philippus Wester, Arabinda Mishra, Aditi Mukherji, Arun Bhakta Shrestha, eds., "The Hindu Kush Himalaya Assessment: Mountains, Climate Change, Sustainability and People," ICIMOD (2019), https://doi.org/10.1007/978-3-319-92288-1_1.

Anthropologists Cymene Howe and Dominic Boyer recognize, "[i]n melting ice both heat and its carbon source are made visible."[310] The Mingyong glacier, one of the world's fastest melting glaciers, bears witness to another specific factor of melting ice: black carbon and soot. The emission of these particles triggers converging effects of climate change, such as changing clouds, monsoon circulation, and accelerating ice melt. A large quantity of the black dust that ends up being deposited on the glaciers is produced in the Indo-Gangetic Plains, located just at the feet of the Himalaya region. The white reflective surface of the glaciers is darkened by the black dust which in turn hastens thawing. The melting of the ice also destabilizes the surrounding rocks, which crumble in landslides and destroy entire villages downhill. Mountains are places of ecological but also cultural importance, and their alteration brings psychological impacts on local populations that are vastly overlooked by reports and studies. The indigenous people living in the Himalaya region, for example, whose cultures have been bound to these glaciers for centuries, perceive the meltdown of their landscape as a failure to show respect to sacred beings or to follow proper conduct.



→ Southern Tibetan Plateau. The image contains modified Copernicus Sentinel data, 2016, processed by ESA European Space Agency. Under CC BY-SA 3.0 IGO

As the third pole's vast frozen reserves of fresh water make their way down to the Indian Ocean, they contribute to sea level rise in the low-lying deltas and bays of Asia, from Bangladesh to Vietnam. But sea level rise is not the only consequence; melting glaciers are also a secondary source of pollutants, as Gaia Vince explains in the *Guardian*: "glaciers are time capsules, built snowflake by snowflake from the skies of the past and, as they melt, they deliver back into circulation the constituents of that archived air. Dangerous pesticides such as DDT (widely used for three decades before being banned in 1972) and perfluoroalkyl acids are now being washed downstream in meltwater and accumulating in sediments and in the food chain."[311]

310. Cymene Howe and Dominic Boyer, "Redistributions: From Atmospheric Carbon to Melting Cryospheres to the World Ocean," e-flux Architecture (September 2018), https://www.e-flux.com/architecture/accumulation/212496/redistributions/.

311. Gaia Vince, "The world has a third pole – and it's melting quickly," *The Guardian* (September 15, 2019), https://www.theguardian.com/environment/2019/sep/15/tibetan-plateau-glacier-melt-ipcc-report-third-pole.

**Systemic Violence Against Rohingya People**

A Muslim population indigenous to Western Myanmar, a region now known as the state of Rakhine, the Rohingya people have suffered systemic persecution in Myanmar, which began over fifty years ago, ever since the Muslim minority had been deliberately designated as a national threat by the military forces who staged a coup d'état over Myanmar, then known as Burma. The most recent wave of violence inflicted on the Rohingya people since 2012 is only the continuation of events that have unfolded since the rise of ultra-nationalist ideology based on the racial purity of the Myanma ethnicity and its Buddhist faith. In 1982, the Myanmar government passed the Citizenship Act recognizing 135 ethnic groups, of which the Rohingya, with a population of about 1 million at the time, were excluded, officially making the population stateless. Less than a decade after, Myanmar's military launched Operation Pyi Thaya or "Operation Clean and Beautiful Nation," aimed to scrutinize every individual in the state to define if they are citizens or alleged illegal immigrants. This resulted in widespread rape, arbitrary arrests, desecration of mosques, destruction of villages and confiscation of lands among the Rohingya people.[312] The operation led 250,000 Rohingya refugees to flee to Bangladesh. Tensions continued to build throughout the early 2000s, with a major outbreak in 2012 which saw Buddhist nationalists—backed by the armed forces—burn entire Muslim neighborhoods, displacing thousands more Rohingya people. In response, the Arakan Rohingya Salvation Army was established to coordinate small-scale attacks on border police stations; its August 25, 2017 attack left twelve police officers dead, sparking a brutal retaliation by the state security forces which led to increased wave of ethnic cleansing, the burning of 210 villages, and the exodus of 400,000 Rohingya to Bangladesh. Myanmar's State Counselor Aung San Suu Kyi, who won the Noble Peace Prize in 1991 for her nonviolent support for democracy in Myanmar, has been widely criticized for her inaction and lack of response to the genocide of the Rohingya in Rakhine.

More than thirty refugee camps have been established across Bangladesh and as the country struggles to accommodate over a million Rohingya refugees even with foreign aid, effects of climate change are likely to further challenge the dramatic displacement of the Rohingya people. The Kutupalong refugee camp in southeastern Bangladesh, which is said to be the world's largest refugee camp, is projected to be one of the worst-hit regions in South Asia by human-induced changing monsoons patterns and cyclones, which also make the area prone to landslides.[313] The indiscriminate deforestation and land degradation meant to make way for the 2,345 hectares camp also make the precariously placed settlement particularly vulnerable to sea level rise. In 2015, 50,000 people migrated to the capital city every month because of the irreversible impacts of rising sea levels on their villages and agriculture.[314]

312. Ibid.

313. Malavika Vyawahare, "Cox's Bazar: Rohingya camp to be hardest hit by climate change," Al Jazeera (December 19, 2018), https://www.aljazeera.com/indepth/features/cox-bazaar-rohingya-camp-hardest-hit-climate-change-181218233254118.html.

314. Tahmima Anam, "The Rohingya crisis is not an isolated tragedy – it's the shape of things to come," *The Guardian* (May 19, 2015), https://www.theguardian.com/commentisfree/2015/may/19/rohingya-andaman-sea-refugees-migration.


→ Rohingya refugees in Cox's Bazar, Bangladesh carrying a piece of cloth with demands in protest of repatriation to Myanmar, which many in the community see as a dangerous return trip. Public Domain.

**Indian Monsoon Chaotic Multistability**

The Indian Ocean, the only ocean in which currents and winds reverse direction in a system called monsoons, is at the sharp edge of global transformation. The word "monsoon" first appeared in English in the late sixteenth century, derived from the Arabic *mawsim* ("season"). The monsoon is actually a seasonally reversing wind accompanied by corresponding rainy and dry seasons which dominate the weather in the Indian subcontinent. The monsoon allowed for the traversing of the Indian Ocean since the earliest explorations. The late fifteenth century Arab navigator Ahmad Ibn Majid recorded this nautical knowledge in an early treatise indicating how regular and predictable the sailing schedules were for each of the Indian Ocean's seas.[315]

The key theoretical breakthrough leading to a better understanding of the complex Indian Monsoon Chaotic Multistability did not come until the late 1960s, when meteorologist Jacob Bjerknes described the principles by which the equatorial Pacific Ocean, acting as a planetary heat engine coupled with the trade winds, is able to affect rainfall patterns throughout the tropics and even in the temperate latitudes. Rapid warmings of the eastern tropical Pacific (called El Niño events) are associated with weak monsoons and synchronous drought throughout vast parts of Asia, Africa, and northeastern South America. When the eastern Pacific is unusually cool, on the other hand, the pattern reverses (La Niña events), and abnormal precipitation and flooding occur in the same "teleconnected" regions.

The monsoons' oscillating winds are primarily influenced by the seasonal dynamics of the Intertropical Convergence Zone (ITCZ)—the low-pressure zone where northeast and southeast trade winds converge. But *while the South Asian monsoon is widely studied and perceived as an earth-system dynamic, it must be understood as more than an atmospheric phenomenon. As human-induced climate change is considerably impacting the South Asian monsoon cycles, it is fundamental to acknowledge human involvement in the making of the weather and the environment. More than a seasonal rain, the monsoon's magnitude and repercussions across politics, economics, culture, religion, and infrastructure make it a major reorganizing force in the Indian subcontinent. The monsoons affect everyday life, define local cultures, and change the ways societies operate:* a large number of

315. Prasannan Parthasarathi, ed., *Indian Ocean Current: Six Artistic Narratives* (Boston: McMullen Museum of Art, Boston College, 2020), 142.

farmers depend on the monsoon rains, whereas a large number of people in the region change their habits based on the season. In Chennai, for example, months before the heavy rains reach their peak, the inhabitants engage in rituals and dietary regimes in order to prepare their bodies for the rains, while infrastructures are adapted and resources reallocated.

To assess the extent and deadly impact of monsoon irregularities, Mike Davis in his book *Late Victorian Holocausts: El Niño Famines and the Making of the Third World* examines a series of monsoon failures and resulting El Niño–induced droughts and the famines that they spawned around the globe in the last third of the nineteenth century. Davis calculates that 30 to 60 million persons perished during the three global "subsistence crises" of that time, triggered by natural incidents and aggravated by the imperial arrogance of rulers.[316] He writes: "The great famines are the missing pages. [...] At issue is not simply that tens of millions of poor rural people died appallingly, but that they died in a manner, and for reasons, that contradict much of the conventional understanding of the economic history of the nineteenth century. For example, how do we explain the fact that in the very half-century when peacetime famine permanently disappeared from Western Europe, it increased so devastatingly throughout much of the colonial world?"[317] The interlinking of monsoon fluctuations and the forcible integration of "tropical humanity" into the economic and political structures of the "modern world system," can be considered the prehistory of what journalist Christian Parenti has called the "tropic of chaos."

The architecture of the monsoon has been widely researched by architecture researcher Lindsay Bremner, who is leading a research project called Monsoon Assemblages based in Chennai, that draws on environmental humanities, natural sciences, and spatial design to reframe the understanding of climate change in monsoon cities in South Asia. For Bremner, the monsoon is "ground, water, and air; it is a relation of things in its very core. It is about atmospheric conditions, sea temperatures, dust particles... It is about water in the air, water in the ground, ground in the air. It is an extraordinary planetary wide system that no one really understands and, yet, is experienced very locally."[318] Thinking through assemblages provides a paradigm to understand the monsoon as an interconnected system woven into the fabric of the city. Despite the evident nature of the monsoon as a major organizing principle of urban life and space in South Asian cities, this discourse has not entered the equation of neoliberal urban development models, which are guiding cities towards expansion without considering monsoon cycles and their changing conditions due to climate change.

316. Mike Davis, *Late Victorian Holocausts: El Niño Famines and the Making of the Third World* (London and New York: Verso, 2017), 7.

317. Ibid., 8–9.

318. Lindsay Bremner in conversation with Dámaso Randulfe, "On Monsoon Assemblages," *Migrant Journal* no. 3 (2017).

**Our Wooden Shelter: Mangrove Forests along the Coasts of India**

Any person visiting a wetland for the first time would experience a sense of wonder. It is a space where the division between ground and water blurs, a land of amphibians and reptiles, of fish and mammals, relying on vegetation we perceive as neither land nor water. Wetlands and their inhabitants, human or nonhuman, challenge our monolithic perception of earthly and watery domains. Along coastal wetlands all around the globe, mangrove forests silently watch over the liminal line where the ground ends: so sharp on cartographic maps, so porous, indefinite, and expanded when perceived through the human body.

→ Sundarbans web. Contains modified Copernicus Sentinel data (2016), processed by ESA European Space Agency. Under CC BY-SA 3.0 IGO

Mangroves are eerie beings for those who are not familiar with them. Their ethereal roots grow in the middle of nothing, feed on air, mud, and brackish water, and intersect in inextricable entanglements where smaller life forms breed and thrive, under the water, above their trunks, and in any space in the middle. Each lifeform finds a place it feels is adequate, where the balance between water, air, and solid ground is perfectly balanced for its peculiar way of living.

Following mangrove forests around the world, from Fiji to the Caribbean, following the coasts Africa and the Americas, and covering the populous coasts of the Indian subcontinent, many adaptations of the same tale are heard, teaching humans a basic survival lesson. If one is wandering in a wetland forest and is surprised by an unexpected storm, the best thing to do is try and find a large mangrove tree that allows one to shelter and find refuge under its roots and branches. Together with the other trees, the forest will break down the stormy winds and protect the temporary host with its wooden hug.

*The Mangrove People: The Sundarbans*

Among the green lines hugging coastal lands are the mighty Sundarbans. Covering the coasts of the Bay of Bengal between India and Bangladesh, the Sundarbans compose the world's largest swamp forest, thriving thanks to the mud and water brought by the mighty delta formed by the Ganges and Brahmaputra rivers. The Sundarbans span an area of more than 20,000 square kilometers, half of which is covered by mangroves, as well as 102 islands, 54 of which are inhabited by humans. In these lands, people subsiding mostly of fishing and agriculture coexist with several unique plants, weeds, and vast biodiversity of animals, among them the mythic Bengal tiger.

In 2020, the devastating cyclone Amphan hit the Sundarbans before whiplashing Kolkata and threatening Dhaka—two cities of around 15 million inhabitants each. For the delta people, Amphan meant the preemptive displacement of 360,000 people who moved to shelters, and widespread destruction for those who stayed, seeing more than 650,000 houses leveled. This is a *recurring* catastrophe: mangrove residents have seen cyclones in 2019 (Bulbul), 2009 (Aila), 2007 (Sid), and the Odisha cyclone in 1999, the most violent ever recorded. Local inhabitants also face a more furtive, *ongoing* catastrophe: grave subsidence rates concurring to rising sea levels cause the irreversible flooding of an increasingly high number of small islands, forcing families to relocate every twenty to thirty years.

Subsidence, air and water pollution, and loss of biodiversity are some of the problems that mangroves fundamentally contribute to tackling. The roots of mangroves raise coastal mudflats level, which in turn sustain fish and several other animal species. Mangroves also act as natural carbon sinks, absorbing $CO_2$ at a much faster rate than regular forests—in fact, studies show that the Sundarbans absorb $CO_2$ at even faster rates than the Amazon rainforest, almost neutralizing the effect of coal-fueled power plants in the area, even considering the harm those plants inflict with water pollution and extraction.[319] Mangroves lay down peat in the soil, sequester and burying $CO_2$ in saline soil that prevents the production of methane (another greenhouse gas), thus creating a substantial extra carbon store in the soil. Mangroves are natural carbon-scrubbers, taking $CO_2$ out of the atmosphere and packing it away, for millennia or more, in their rich soil.[320]

Power plants and other "dirty" anthropic activities are damaging the Sundarbans forest. At the same time, several dams on the Ganges and Brahmaputra bring down the amount of muds and sediments, needed to sustain the mangrove forest and causing seawater incursions that make the mangroves rot. For example, the construction of the Farakka Barrage in 1975 is likely the primary cause for the reduced water discharge from the Ganges River, from 3700 cubic meters per second in 1962 to 364 cubic meters per

319. Raghab Ray and Tapan Kumar Jana, "Carbon Sequestration by Mangrove Forest: One approach for managing carbon dioxide emission from coal-based power plant," *Atmospheric Environment* vol. 171 (Oct 2017): 149–154.

320. James Hutchison, Andrea Manica, Ruth Swetnam, Andrew Balmford, and Mark Spalding, "Predicting Global Patterns in Mangrove Forest Biomass," *Conservation Letters* vol. 7, no. 3 (May–June 2014): 233–240.

second in 2006.[321] At this rate of freshwater depletion, it is evident that the fragile mangroves, not accustomed to saltier brackish water, will die because of the drastic change of salinity in the so-called "tidally active" part of the delta.

Mangroves have been acting for millennia as a natural infrastructure providing essential services to the communities around them, but now they are suffering from anthropic activities. Other places, such as Fiji,[322] are already beginning to rely on mangroves as part of a "green infrastructure," a way of envisioning strategic infrastructure in such a way that it supports the development of natural ecosystems. This exponentially enhances these ecosystems' functions to support human communities, which is intuitive when thinking of the fact that the Sundarbans, for example, slow down cyclone winds and storm surges' waves by up to 31 percent.[323]

In a political system that bases its policy on risk calculation in economic terms first and foremost,[324] first attempts are now being made to calculate the monetary impact of the services mangroves can provide. A World Bank-funded study that crossed results from research done in forty-two countries, concluded that if no effort is made to preserve mangrove forests, at least 29 percent will disappear, and that "under current climate and mangrove coverage, 3.5 million people and roughly $ 400 million in gross domestic product of are at risk. In the future climate change scenario, the vulnerable population and gross domestic product at risk would increase by 103 and 233 percent, respectively."[325] Integrated mangrove maintenance systems can also cut the costs of protecting coastal areas by a factor from two to six times compared to traditional defense systems, such as embankments and sea walls.

*The Mangrove City: Coastal Depletion in Mumbai*

Another example of disregard for the environment and lack of a green infrastructure strategy in India is the city of Mumbai. Built on what was once an archipelago of seven islands connected by strips of reclaimed land, India's most populated city is a victim of increasingly violent typhoons and damages, especially in newly built areas of skyscrapers and luxury real estate. Here, the damages done by careless extractivism and infrastructure building are even more evident than in the Sundarbans, since it affects a thriving metropolis: as environmental activist B. N. Kumar, claims, a much higher number of people are now conscious of climate change because they can't ignore it now that it's at their doorstep.

321. Shafi Noor Islam and Albrecht Gnauck, "Mangrove Wetland Ecosystems in Ganges-Brahmaputra Delta in Bangladesh," *Frontiers of Earth Science in China* vol. 2 no. 4 (January 2008): 439–448.

322. Moushumi Chaudhury and Namrata Chand, "From Mangroves to Tin Roofs: Fiji Uses Built and Natural Infrastructure for Climate Adaptation," *World Resources Institute* (May 9, 2019), https://www.wri.org/blog/2019/05/mangroves-tin-roofs-fiji-uses-built-and-natural-infrastructure-climate-adaptation.

323. Narayan S, Beck MW, Reguero BG, Losada IJ, van Wesenbeeck B, Pontee N, et al., "The Effectiveness, Costs and Coastal Protection Benefits of Natural and Nature-Based Defences," *PLoS ONE* vol. 11, no. 5 (2016): 4.

324. Ulrich Beck, *Risk Society: Towards a new modernity* (London: SAGE Publications, 1992), 183–285.

325. Brian Blankespoor, Sasmita Dasgupta, Glenn-Marie Lange, "Mangroves as Protection from Storm Surges in a Changing Climate," Policy Research Working Paper 7569 (2016).

The mangrove forests surrounding Mumbai form a green line between the city and the Arabian Sea and provide all the natural services described above. Yet, during the 1990s, almost 40 percent of them were destroyed for land reclamation, the construction of infrastructure, and the extraction of minerals.[326] The local government has now taken measures to prevent the destruction of mangroves by private enterprise, for example for wood harvesting or through garbage dumping. Still, many forests continue to be either suffocated by roads, which block their access to water, or directly destroyed to make space for new infrastructure. Most notably, the bullet train project connecting Mumbai to Ahmedabad will result in the destruction of over 54,000 mangroves and the new Navi Mumbai Airport in being built in an exceptionally green area rich in vegetation and wildlife. Over 60 percent of the proposed zone for the airport already falls under ecologically sensitive areas with mangroves, mudflats, and bodies of water, and it would include the complete destruction of five mudflats. Such an irresponsible plan, according to a study by the Bombay Natural History Society, will lead to "a quarter of a million birds spending more time in the air by forming large flocks or settling along with green patches closer to the runway, increasing chances of bird hits or lead to difficulty during takeoff or landing."[327]

The demand of environmentalists to preserve the ecosystem is usually branded as being "anti-development," while what they are asking for is a rethinking of development strategies so that they won't harm an already precarious ecosystem. In several cases, the entities responsible for mangrove destruction propose to relocate them, though it is often hard to find a suitable place for mangrove plantations. They end up being in cultivated fields, far from the coast where they should be, naturally irrigated by the sea, providing their infrastructural services. The mangroves are already where they are supposed to be, and those lands cannot be moved.

Journalist and activist B. N. Kumar, a native of the green suburb of Navi Mumbai and head of the Nature Connect Foundation, has seen his hometown changing from a "mini Amazon forest" to an area of environmental devastation. Land and mangrove forests have been depleted to grow the megalopolis, despite an increasing conflict between careless developers and the Forest Department. Kumar and his team have launched several viral hashtag campaigns such as #IAmMangroveIAmDying and #SaveMangrovesSaveOurCity. These, along with other unconventional measures such as a poster art exhibition exploring ecologic topics, proved successful with many young people, who commit to mangrove protection and restoration around the coasts of the Mumbai Metropolitan Region and the Thane Creek, the blue line separating the central city from the once-idyllic suburbs of Navi Mumbai and Uran.

Things seem to be changing in the Mumbai metropolitan area. Recently, the Forest Department blocked a proposal by giant corporation Tata to build a new high-voltage power plant in Navi Mumbai. The plant was supposed to send electricity to the center of the city through the Thane Creek, destroying an area of 60 hectares of mangrove in peripheral neigh-

326. V. Vijay, R. S. Biradar, A. B. Inamdar, G. Deshmukhe, S. Baji & Madhavi Pikle, Mangrove mapping and change detection around Mumbai using remotely sensed data," *Indian Journal of Marine Sciences* vol. 34, no. 3 (Sept 2005): 310–315.

327. Bajaru S., Prabhu M., Khot R., and Apte D., "Coastal wetlands and waterbirds of Navi Mumbai: Current Status," Bombay Natural History Society (2019).

borhoods prone to flooding, especially during the monsoons. At the same time, the fishing community's voice is increasingly heard: they are the first ones affected by the destruction of mangroves, as the trees' roots are natural breeding grounds for several species. One of the reasons why peripheral fishing villages nearby Mumbai were much less affected by cyclones and storm surges is precisely the presence of mangroves. Recently, some fishing villages were flooded for the first time in centuries, stirring local activism. While this did not stop the ecosystem depletion for big infrastructure and real estate projects, consciousness and grassroots action play a crucial role in institutional response

*Us, the mangroves, and our ongoing catastrophes*

Mangroves can, importantly, assume a metaphorical value for humans: a different way of envisioning our presence on this planet, as a being inextricably entangled with others that can profit from a pacific coexistence. The #IAmMangrove hashtag is not to be taken literally, but the Mumbaikars are invited to think about their existence and the trees' existence as part of the same organic cluster. Kumar states how the traditional spirituality of many Indians is based on the belief in many elemental Gods. They inhabit coasts, mountains, and rivers, especially the Ganges, the sacred river which flows from the Himalayas to the swamp where the Sundarbans grew over millennia. For a long time, the Ganges was the most polluted river in the world due to industry discharging waste into its waters, along with city sewers. It was infecting those who believed that dying fabrics on its banks in Varanasi would bless them. Kumar says he never saw the Ganges's water as clean as it has been during the Covid-19 crisis.

If we were to take mangrove forests, and especially those born from the Ganges's water as a critical metaphor for envisioning our relationship with nature, we cannot ignore not only the recurrent but especially the ongoing catastrophes that hit our biosphere, widely caused by anthropic activities. Philosopher Fréderic Neyrat, in his 2016 essay "Biopolitics of Catastrophe: How to Avert the Past and Regulate the Future," analyzes how governments tend to adopt a relief-based approach to catastrophes, acting upon the effects but widely ignoring the causes. Neyrat builds on Ulrich Beck writing that the *Risk Society* is a "catastrophic society. In it, the state of emergency threatens to become the normal state,"328 highlighting how the ongoing environmental catastrophe is the embodiment of the warning Beck issued in 1992.

*Ongoing catastrophes* blur the boundary between accident and apocalypse, to the extent that it makes it hard to even recognize that boundary, as they have "a crazy relation with the world. This crazy relation can be defined as a relation of continuity grounded on a permanent discontinuity."[329] By "biopolitics of catastrophe" Neyrat means the incoherent political response born from the fear of the ongoing environmental disaster and the fundamental impossibility to grasp this "crazy relation," which in turn produces forms of governance incapable of effectively tackling such threats.

328. Beck, *Risk Society*, 79. Italics in original

329. Fréderic Neyrat, "The Biopolitics of Catastrophe, or How to Avert the Past and Regulate the Future," *South Atlantic Quarterly (April 2016)*: 248.

It is fundamental to stress how in any moment of this ongoing catastrophe there is constant friction between misfortune (which cannot be accounted for, for example, in court) and injustice (which needs to be acted upon), where the first is stressed and the second dismissed. To explain this, Neyrat uses the disaster in Fukushima as an epochal example: "a tsunami (or a cyclone, for what matters) is not an injustice, but the damage done by the tsunami is, because the destruction of mangroves and coral reefs created (or amplified) the destruction."[330]

This injustice needs to be addressed, and faced in order to prevent such destruction from reoccurring. We need to look to the mangroves and all similar ecosystems for a political shift, one not merely derived from scientific observation and technological drives but also spiritual and philosophical in nature.

The greatest challenge of our time is to envision this necessity: we need a change from *bio*politics to *eco*politics, one that does not only protect the life of humans (from the Greek βιός – bios) but that considers the necessity to take care of our common home (οἶκος – oikos, which drifted to "eco"). We need a change of perspective, and looking at metaphorical beings such as mangroves with sympathy can help shifting our philosophical groundings. A philosophical stance that continues to ignore the needs of the biosphere hosting us, to see our planet as a resource to be exploited, and humans as beings radically detached from the system which supports our own existence, is the most dangerous threat against the development of ecopolitics.

Text by Pietro Consolandi

**Ship-Breaking in Chittagong**

As they reach the end of their operational lives, large vessels from around the world are towed to coastal shipyards to be broken down and repurposed. The ship recycling, or ship-breaking industry is largely situated on the edges of the Indian Ocean, with the largest yards in India, Bangladesh, and Pakistan. Of a 1,000 vessels recycled each year, approximately 70 percent are dismantled in South Asia, where safety and environmental standards are typically far lower than elsewhere.[331] Vessels are "beached" on the shore, where they are stripped of materials such as aluminum, steel, and iron for resale or reuse. In the process of this, workers, and the local community and environment are exposed to toxic and hazardous materials found within these vessels, typically including heavy metals, organotin compounds, asbestos, oil and fuel, and polycyclic aromatic hydrocarbons. Poorly managed or unregulated shipyards pose extreme health and safety risks to workers, who may use rudimentary tools without suitable protective equipment or infrastructure to access and stabilize vessels. Child labor, exploitation of migrants, serious illnesses and injuries, and high fatality rates are commonplace, and the impacts of lacking labor rights reverberate throughout society. Furthermore, beaching leaves the local environment open to pollution from ships, which ravages

330. Ibid., 261.

331. Environmental Justice Atlas: Ship-breaking yards, at https://ejatlas.org/type/ship-breaking-yards

coastal waters and damages the livelihoods of fishers and farmers. It is not unusual for large expanses of mangroves to be cleared to accommodate ships, which removes a vital component of the local ecosystem and enhances vulnerability to flooding and storms.


→ Shipbreaking platform. Photo: Bellona Foundation. Chittagong, 2014. Under CC BY-NC-SA 2.0 license

Better regulated yards operate elsewhere, namely in Turkey and China, although issues relating to waste management and working standards persist. Only 3 percent of the annual gross scrapped tonnage is recycled outside these five countries, which offer irresistibly low prices for ships to be broken. Major shipowners and operators conceal their activities through re-flagging and re-naming ships prior to sale, and have been criticized for dodging the higher prices required to recycle ships responsibly and sustainably. Growing awareness of the deplorable labor and environmental standards throughout the ship-breaking industry has led to pressure on international bodies to enhance regulations.[332] This responsibility largely lies with the United Nations International Labour Organization and the UN International Maritime Organization (the ILO and IMO). The ILO has produced non-binding guidelines for safety and working conditions in the ship-breaking industry, while the IMO adopted the Hong Kong Convention (HKC) in 2009 to demand environmental standards, accountability, and enforcement. Both agencies have been heavily criticized for their inadequacy, and the HKC is unlikely to come into force for many years. The European Union adopted its own ship recycling regulations in 2013, which exceed the requirements of other international bodies. However, the resulting higher expenses and lower offers for end-of-life vessels at EU yards has arguably driven more business to the South Asia. Although campaigns continue to fight for improved standards around the world and greater accountability from shipowners and operators, the issues of ship recycling are endemic in the shipping industry, and drastic intervention is needed for the situation to improve.[333]

Text by Fiona Middleton

332. See for example: https://www.theguardian.com/global-development/2017/dec/02/chittagong-shipbreaking-yards-legal-fight

333. Website of the NGO Shipbreaking Platform, at: https://www.shipbreakingplatform.org/

**Diego Garcia Displacements**

The island of Diego Garcia is the largest island in the Chagos Archipelago, which comprises sixty-four atolls in the central Indian Ocean. The Islands were known to Maldivian sailors but were uninhabited until the eighteenth century, when plantations were established which then sustained 200 years of colonial control. In 1965, the British government purchased the Chagos Islands from Mauritius, where independence from British rule was impending, and reconfigured the islands as the British Indian Ocean Territory (BIOT). The United States then leased Diego Garcia until 2016 for the purpose of building a military base, due to its strategic location overlooking the Persian Gulf. Some 2,000 Chagossians were forcibly removed from the islands and rehomed in Mauritius and the Seychelles. These countries have since made legal claims to the BIOT, and the Chagossians themselves have battled for decades at the UK High Court to be allowed to return. In 2002, the UK government gave Chagossians and their children the right to British passports, many of whom subsequently emigrated to the UK, where they faced a hostile welcome. They were placed in temporary housing, from which many have never moved.

→ The U.S. Navy aircraft carrier USS *Saratoga* (CV-60) tied up at the British Naval Base at Diego Garcia, 1987, Photo: US Federal Government, Public Domain.

The UK government has repeatedly utilized environmental discourse and legal instruments to maintain that the Islands re distant and inhospitable, bringing to mind Elizabeth DeLoughrey's idea of the "myth of isolates," describing how the image of islands as distant laboratories was used to justify military command of Pacific Islands for nuclear testing.[334] Feasibility studies commissioned by the UK government in 2002 and 2015 state, respectively, that forecasts of sea level rise and "mass mortality" of coral reefs pose a challenge to long-term resettlement of the Chagos Islands, and that resettlement would impact protected wetland and bird species areas established by the BIOT in Diego Garcia. The importance of the Islands for marine scientific research has also been emphasized, and in 2010 the Chagos Marine Protected Area (MPA), the world's largest no-take area, was controversially created around the islands. It was suggested that the MPA was intended as an obstacle to the Chagossians' return, and this intention was confirmed in a 2010 governmental communication leaked by WikiLeaks. Despite a 2019 ruling by the International Court of Justice that the division of

334. Elizabeth DeLoughrey, "The myth of isolates: ecosystem ecologies in the nuclear Pacific," *Cultural Geographies* vol. 20 (2013).

the Chagos Islands from Mauritius was unlawful, and the obligation for the UK to cede control over the Islands, the UK maintains that the Chagossians may return once the UK–US agreement ends in 2036.[335] As the only British colonial settlement established *after* decolonization, the Chagos Islands continue to stand at the center of a legal maelstrom regarding the rights of exiled Chagossians and the ongoing occupation of the Islands.

Diego Garcia is considered, alongside the base on Guam, the most geostrategically important island and logistics support base for the US military. It is a keystone of the US Navy's "Strategic Island Concept"—consisting of maximally isolated, yet maximally connected operation points. Diego Garcia was selected, after extensive review of Indian Ocean sites, for its geomorphology as an atoll. "The atoll, simply put, is an island emptied of its geologic content. It is appropriate, then, that its interior has been filled with a history of logistical operations," write Pierre Bélanger and Alexander Scott Arroyo.[336] Following the evacuation of armed forces from Vietnam, selected sites in Okinawa, Japan and Diego Garcia were slated for significant expansion of capacity. Spearheaded by US Naval Mobile Construction Battalions, better known as "Seabees," Diego Garcia began its billion-dollar transformation: dynamiting deep-draft access channels into the lagoon and blasting out tracts of coral reef for use as paving aggregate for the airfield and fill for harbor breakwaters. Since the mid-1980s, the base has boasted a wharf and facilities suitable for an aircraft carrier, and the lagoon provides anchorages for other warships and ships loaded with pre-positioned equipment. The US Navy often stations a submarine tender and a repair and logistics ship to support deployed attack submarines.

Today, the military base hosts only 360 permanent military personnel. It is capable of distributing half a million tons of cargo to combat in the Indian Ocean and Arabian Sea, serves as a launchpad for military operations in the Middle East and as a refueling point for Air Force patrols headed to the South China Sea, and was even designated an emergency landing spot for NASA missions. The importance of fuel and cargo distribution for contemporary warfare makes "Diego Garcia's lagoon a lake of fuel" as Bélanger and Scott Arroyo describe it. They explain: "Given the characteristics of contemporary conflict—typified by decentralized, asymmetric warfare, rapid deployment to climatically diverse, geographically remote combat theaters across the globe, and multiple, small, forward deployed expeditionary forces in infrastructurally deficient conditions—both combat and logistical operations have become increasingly reliant on airlift of fuel and sensitive military cargo from sealift and surface distribution terminals into locations inaccessible or insecure by road."[337]

The US military is one of the largest institutional consumers of oil in the world. Every year, the armed forces consume more than 100 million barrels of oil to power ships, vehicles, aircraft, and ground operations, and this seems unlikely to change.[338] The US continues to pursue open-ended operations around the globe, with the life-cycles of existing military aircraft

335. For a complete legal history, see https://www.chagossupport.org.uk/.

336. Pierre Bélanger and Alexander Scott Arroyo, "Logistics Islands: The Global Supply Archipelago and the Topologics of Defense" *Prism* vol. 3, No. 4 (April 2014): 60.

337. Ibid., 64.

338. Union of Concerned Scientists report: "The US Military and Oil" (June 1, 2014), see https://www.ucsusa.org/resources/us-military-and-oil.

and warships locking them into hydrocarbons for years to come. In view of this future, the exploitation of the connectivities of ocean and air as "the militarized mediums of the globe" will continue to be strategically important pathways to overcome the superpower's continental operational base.

Text by Fiona Middleton and Daniela Zyman

**MH370 Search Zone**

In spite of the myriad technologies developed to trawl, measure, and depict the ocean, we are starkly reminded of our limitations by the infamous disappearance of a Malaysia Airlines Boeing 777 in the southern Indian Ocean on March 8, 2014. Weighing approximately 216,000 kilograms when it disappeared, the aircraft carried 227 passengers and twelve crew members, as well as cargo that was part of various supply chain journeys, and advanced navigation systems to chart its course and communicate its position. This load disappeared without a trace over the Gulf of Thailand on the flight from Kuala Lumpur to Beijing, and has since evaded all attempts to locate it.

In absorbing the vessel's web of connections, both human and technological, the Indian Ocean has proven its sheer scale and unknowability, even as the search for MH370 has explored it via a network of scopic technologies.[339] The consistent reporting about the search for MH370 in the international media contrasted with its loss and the revelation of the vast unknown, uncharted tracts of space in sky and sea. In a world dense with data relating to location, opinion, and emotion, the missing aircraft produced a sense of "radical absence"[340] that spurred on the development of multifarious theories and possibilities surrounding its fate.

The search has foregrounded the opacity of seawater to remote sensing via satellites, as deployed technologies are forced to engage with the ocean's overwhelming volume and its mobility. Calculations based on six pings that may have been transmitted from the airplane's black box place the likely crash site somewhere between the Antarctic Circumpolar Current and the Indian Ocean Gyre. Increasingly detailed underwater mapping has been carried out in that location, first using satellite altimetry and subsequently with multibeam sonar, ultimately producing huge quantities of data and greatly enhancing knowledge of bathymetry in the search area.[341] The development of models and decision-based search systems has somewhat narrowed down the search for the aircraft, supported by a flaperon washed up on Réunion ten months after the flight disappeared as well as two other pieces of debris that washed up in 2016. Multiple states came together for a collaborative search variously painted as an opportunity for constructive relations and an opportunity to exert their presence across contested maritime borders and demonstrate their military and technological

339. Lindsay Bremner, "Technologies of Uncertainty in the Search for MH370," *Art in the Anthropocene: Encounters among Aesthetics, Politics, Environments and Epistemologies*, Heather Davis and Etienne Turpin, eds. (London: Open Humanities Press, 2015), 199–212.

340. Michael Richardson, "Radical absence: encountering traumatic affect in digitally mediated disappearance," *Cultural Studies*, vol. 32 (2018).

341. Sarah Zhang, "The Search for MH370 Revealed Secrets of the Deep Ocean," *The Atlantic* (March 10, 2017), https://www.theatlantic.com/science/archive/2017/03/mh370-search-ocean/518946/ .

prowess.[342] However, no search is currently active. New evidence is required before initiating another effort, with the main contenders being private companies such as US-based Ocean Infinity, hoping to work on a no-find-no-fee basis.

Text by Fiona Middleton

**Belt and Road Initiative in Southeast Asia**

Launched in 2013, the People's Republic of China's Belt and Road Initiative (BRI, formerly known as One Belt, One Road) aims to establish new trading routes by connecting China, Asia, Europe, and Africa along five integrated pathways. This highly contested, long-term initiative envisages the construction of a trade and transport infrastructure network on land ("Belt") and water ("Road") involving more than seventy countries and accounting for 60 per cent of the world's population. While reviving the historical imaginary of the peaceful cooperation between cultures and nations along the ancient Silk Road, the Belt and Road project clearly aims at reinstating China as a dominant power, with the goal of reorganizing and transforming whole of Eurasia and beyond. Researcher Jegan Vincent de Paul identifies in "the discursive events and materials of the Belt and Road project [...] the super-narrative of a potential world order." [343] Chinese President Xi Jinping describes it as a "community of common destiny for mankind."[344]

Chinese policymakers consider Southeast Asia a critical region for the future success of BRI. China has been working with individual countries in the area to align the initiative with each country's national development goals and initiatives, putting these emergent economic powers in the uncomfortable dilemma of having to choose between participating in BRI participants or working with traditional US allies, unsure which superpower to side with on issues such as the South China Sea and international trade wars.[345] While some Southeast Asian countries are suspicious of China's global masterplan, the incentives brought by BRI would help local governments meet long-standing infrastructural objectives. Indeed, the "hard" and "soft" infrastructures included in BRI appeal to a wide range of Southeast Asian leaders, be it populist leaders in larger democracies seeking to advance grand infrastructure designs, such as President Rodrigo Duterte of the Philippines, or longtime rulers in smaller, authoritarian states looking to preserve regime stability, such as Prime Minister

342. Philip Steinberg, "The Malaysian Airlines tragedy and South China Sea geopolitics," Geopolitics & Security blog, Royal Holloway University (March 12, 2014), https://rhulgeopolitics.wordpress.com/2014/03/12/the-malaysian-airlines-tragedy-and-south-china-sea-geopolitics/.

343. Jegan Vincent de Paul, "Transcending History: Considering a Belt and Road Archive," *Allan Sekula: OKEANOS*, eds. Daniela Zyman and Cory Scozzari (Berlin: Sternberg Press, 2017), 261.

344. Liza Tobin, "Xi's Vision for Transforming Global Governance: A Strategic Challenge for Washington and Its Allies," *Texas National Security Review* (November 12, 2018).

345. Yu Jie, "China and Southeast Asia: Many Belts and Roads to turn," *China's Belt and Road Initiative (BRI) and Southeast Asia*, eds. Michael Cox et al. (London and Kuala Lumpur: LSE Ideas and CIMB ASEAN Research Institute, 2018), see http://www.lse.ac.uk/ideas/Assets/Documents/reports/LSE-IDEAS-China-SEA-BRI.pdf.

Hun Sen of Cambodia.[346] The Asian Development Bank, the biggest backer of BRI, estimates that costs for infrastructural development in Southeast Asia alone amount to a total of 2.8 trillion dollars.

China has given particular attention to maritime routes in its strategic development of BRI in Southeast Asia. Aside from advancing security interests in the South China Sea through intense land reclamation and militarization (which goes against international laws and these territorial operations have resulted in numerous conflicts with neighboring states), China also plans on establishing a series of ports in the Indian Ocean, which its competitors have referred to as its "string of pearls."[347] Chinese companies and state-owned enterprises have already entered into agreements with over thirty countries[348] in relation to particular ports or assumed ownership rights over those ports. One of these crucial ports is the Kyaukpyu deep-sea port in western Myanmar, which will provide Chinese vessels an alternative to the Malacca Strait.

China is heavily reliant on Indonesian maritime chokepoints for its energy needs and imports at large. As recent conflicts in the South China Sea may hinder Chinese access to the Malacca Strait, an issue acknowledged among Chinese political leaders as the "Malacca dilemma," China has developed ties to another neighboring state, Myanmar, whose geographical characteristics enable Beijing to reach the Bay of Bengal while avoiding the Malacca Strait and the South China Sea entirely. The construction of the Kyaukpyu deep-sea port, which is well underway and represents an initial step in the establishment of the "Road" initiative, responds to that. The China-Myanmar economic corridor and the development of the required infrastructure is likely to radically affect the fishing town of Kyaukpyu on a sociological and ecological level.

→ Harshana W, Colombo harbour, Sri Lanka. Photographer unknown. Image is licensed under CC BY-NC 2.0.

346. Prashanth Parameswaran, "China's Belt and Road in Southeast Asia between Boons and Bumps," in *The Asian Forum* (August 2018), http://www.theasanforum.org/chinas-belt-and-road-in-southeast-asia-between-boons-and-bumps/.

347. The term was coined in 2004 by U.S. defense contractor Booz Allen Hamilton (BAH) in a report submitted to the Office of Net Assessment at the U.S. Department of Defense to describe China's strategy in the waters stretching south of the Eurasian continent.

348. "China's expanding investment in global ports" *The Economist* (October 2017), http://country.eiu.com/article.aspx?articleid=965980480&Country=Pakistan&topic=Economy&subtopic=Regional+developments&subsubtopic=Investment%20%20says.

BRI as a whole is still in its initial stages and the direction of its future development remains uncertain. As pointed by Indian Ocean historian Prashanth Parameswaran, "Southeast Asia in many ways best captures this mixed and messy outlook for the BRI as it stands now: where countries are willing to work with China to realize the opportunities emerging from the initiative, even as they remain equally determined to work themselves as well as with others to manage the manifold challenges it can pose for their prosperity and security."[349]

**Antarctica Melting**

Antarctica, the earth's largest ice sheet, contains 90 percent of the world's ice and 70 percent of the world's fresh water—enough water to raise global sea level by an estimate of 58 meters.[350] The earth's polar regions both control and respond to global climate and are especially responsive to changes in the atmosphere and the ocean. Over the last 2.5 million years, the ice sheets have advanced and retreated in a relatively periodic cycle of ice ages. Recent research has found that the melting of the West Antarctic ice sheet during the last interglacial period (also known as the Eemian period, which began 129,000 years ago and ended 116,000 years ago), caused a sea level rise of more than three meters and that it only took the ocean warming by less than two degrees Celsius of for that to occur.[351] For the last 11,700 years, the earth has been withstanding another interglacial age characterized by smaller ice sheets and a relatively stable climate. As the modes of production that dominate the global economy have set into motion a new geological period characterized by warming oceans and increased releases of carbon dioxide into the atmosphere, there is strong agreement among scientists that the Antarctic ice sheet is projected to continue shrinking throughout the twenty-first century and beyond.

The Special Report on the Ocean and Cryosphere (SROCC) initiated by the International Panel on Climate Change (IPCC) in 2016, has provided further evidence for the thawing of the earth's ice sheets. The report states that "from 2006 to 2015, the Antarctic Ice Sheet lost a vast amount of ice mass mostly due to rapid thinning and retreat of major outlet glaciers draining the West Antarctic Ice Sheet."[352] A portion of Antarctica's ice sits on land that is below sea level; as ice shelves that are rapidly shrinking, this means that it is impacted by ocean currents, which accelerate melting. The warming ocean has already begun to percolate into the deep roots of these ice shelve bases, eroding them from below, which is causing huge portions of ice sheets to collapse into the ocean.

This is especially observable in East Antarctica, which lies on the Indian Ocean side of the continent and where this trajectory ends. The eastern region is the largest in the continent in terms of ice mass, holding ten times more ice than the western region. Concerns about East Antarctica are

349. Parameswaran, "China's Belt and Road in Southeast Asia between Boons and Bumps."

350. WCRP Global Sea Level Budget Group, "Global sea-level budget 1993–present," Earth System Science Data vol. 10, no. 3 (2018): 1551–1590. Bibcode:2018ESSD...10.1551W. doi:10.5194/essd-10-1551-2018.

351. Chris S. M. Turneya et al., "Early Last Interglacial ocean warming drove substantial ice mass loss from Antarctica," PNAS vol. 117, no. 8 (February 25, 2020): 3996-4006; first published February 11, 2020, https://doi.org/10.1073/pnas.1902469117.

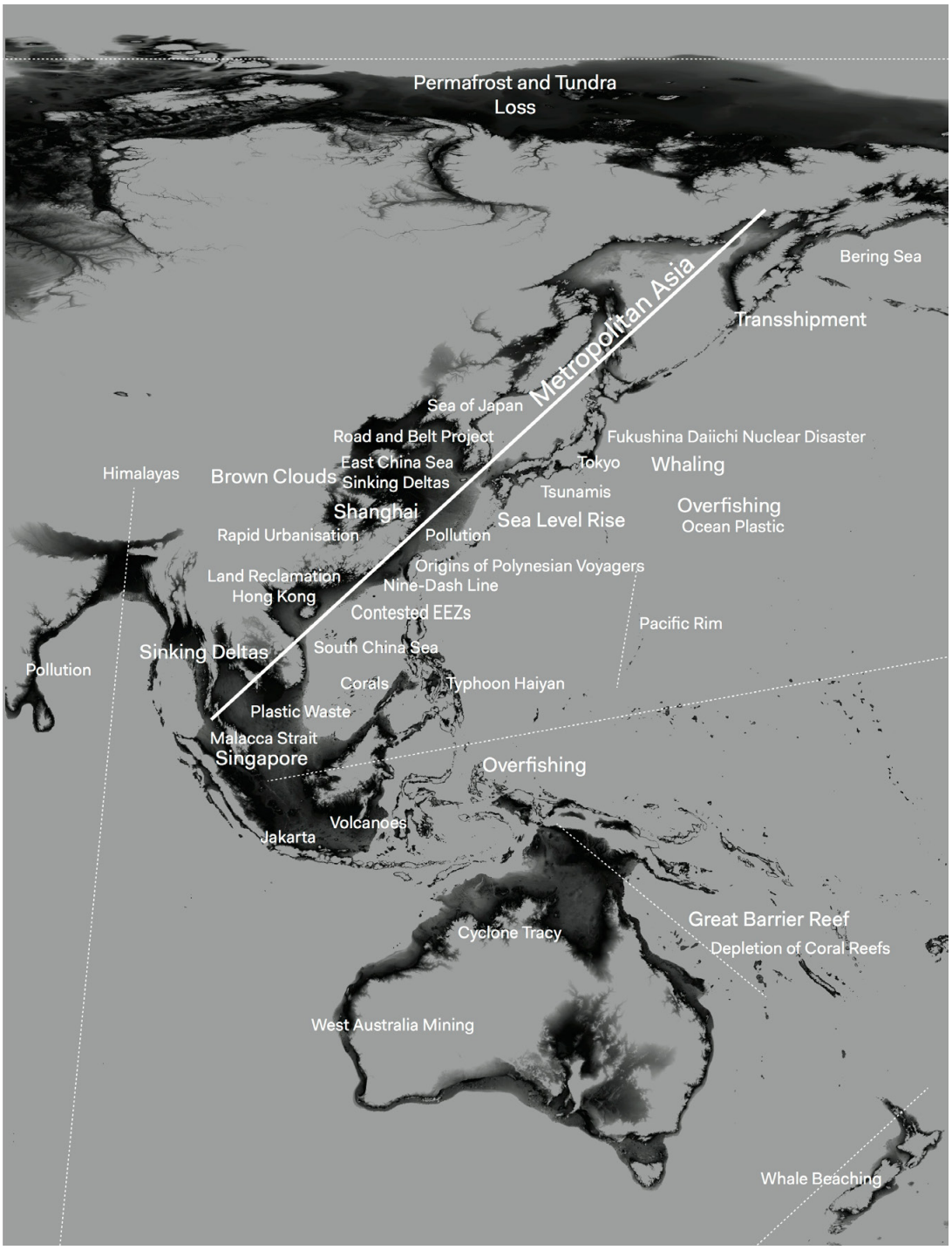
352. IPCC Special Report on the Ocean and Cryosphere in a Changing Climate, 2019

not currently oriented toward its interior plateau as much as its extremities, which are in contact with warming ocean waters. The region's ice shelves float atop the Southern Ocean and as they erode, the vast glaciers behind them could rapidly accelerate their sliding into the sea. This phenomenon already occurred in 2002 as almost the entire Larsen B Ice Shelf splintered and collapsed into the ocean in just over a month. In the years that followed, the glaciers that had been held in place by that massive ice shelf accelerated their slide to the sea by five to eight time.[353] More recently, other glaciers have started to move and collapse, dumping their ice into the Southern Ocean. The Totten Glacier, one of the largest in the eastern region, which contains enough ice to raise global sea levels by at least 3.5 meters,[354] is the most well-known glacier in the region that is subject to marine ice sheet instability due to warming oceans.

353. Nicola Jones, "Polar Warning: Even Antarctica's Coldest Region Is Starting to Melt," *Yale Environment 360* (March 2019). https://e360.yale.edu/features/polar-warning-even-antarctica-coldest-region-is-starting-to-melt

354. Jamin S. Greenbaum et al., "Ocean access to a cavity beneath Totten Glacier in East Antarctica," *Nature Geoscience* vol. 8, no. 4 (2015): 294–298, doi:10.1038/ngeo2388.

# 6. METROPOLITAN ASIA




**Geographical Areas covered**

**Strait of Malacca; Singapore; Gulf of Thailand; Mekong Delta; Pearl River Delta; Shanghai; Yellow Sea; Korea; Japan; Sea of Okhotsk; Bering Strait; North Slope of Alaska.**

From Singapore, to the coast of China, from Taiwan to Japan and beyond to the Bering Strait, this trajectory examines the effects of human activities on the coastal regions of the Asian Pacific. The rapid rise of China is marked by the transformation of the deltas and lowlands of the region into vast metropolitan areas with a dense network of infrastructures supporting the global supply chain.

The seas of Asia are metropolitan: they are an intensification of human activities equal in magnitude to the rapid urbanization of the Asian coasts. Low-lying areas are the endpoint of a logistical system of maritime transport, fisheries, canalization of water systems, transformation of agricultural areas, and depletion of delta ecosystems.

This trajectory indicates how sea level rise is a major threat to the global economy and requires a new way of thinking about the area starting from the sea, along the edge dividing Asian land and the Pacific. It proposes a new geopolitical reading of the region, where human activities are deeply intertwined with complex transformations of the ocean.

Text by Territorial Agency

**Sea Level Rise Displacements and Metropolitan Planning**

Sea level rise is governed by processes that alter the volume of water in the global oceans, primarily caused by the thermal expansion of seawater and transfers of water from terrestrial reservoirs to the ocean, such as the melting of glacial ice. Increases in tropical cyclone winds, rainfall, and extreme waves, combined with relative sea level rise, exacerbate extreme high-water events and coastal hazards. The ocean's increasing heat content (or sometimes called the "ocean heat budget" is the result of greenhouse gases that have accumulated over years and are locked in the earth system. The datasets combined in this trajectory (SRTM15 PLUS, Sentinel 3 Ocean Colour, NOAA Shoreline, and Historical Hurricane Tracks) draw on a variety of remote-sensing technologies and data modelling to indicate how coastal urban zones in East Asia are under threat from a convergence of sea level rise and typhoons.[355]

According to the UN Department of Economic and Social Affairs' 2018 Revision of World Urbanization Prospects, the global urban population has grown rapidly from 751 million in 1950 to 4.2 billion in 2018 and Asia is home to 54 percent of the world's urban population.[356] The Metropolitan Asia trajectory connects coastal areas that have withstood rapid urbanization processes in the last thirty years. The most evident cases are the megacities of China's low-lying wetlands, where high population densities are registered, but other coastal regions from Indonesia to Japan have also seen major urban growth. Reports have confirmed that a great majority of the cities at highest risk of sea level rise are in East Asia, with Guangzhou and Dongguan in China's Pearl River Delta Economic Zone being at the forefront. Other significant financial and trade centers, including Tokyo, Jakarta, Ho Chi Minh City, and Shanghai, are highly vulnerable because of sea level rise.

In a political system that bases policies on economic speculations and risk calculations—defined by Ulrich Beck as the "new paradigm of risk society,"[357]—the evaluation of the devastating impacts associated with sea level rise is becoming a major concern for governments, as well as a lucrative opportunity. Not recognized as a systemic byproduct of contemporary modes of production and consumption that further aggravates inequalities (as geographically dispersed as they might be), sea level rise is primordially accounted for in strictly economical terms of "GDP loss" and investment reallocation. One of the latest reports on the subject was released earlier this year by the insurance and risk consultancy company Verisk Maplecroft. Barely acknowledging the causes that drive the human-induced threat of sea level rise, the report draws concerns over the "the risk of $ 348bn of GDP loss" across China and urges for further "waves of investment" in disaster infrastructure such as building sea walls and tidal barriers in efforts to "counter sea level rise."[358]

355. https://www.ncdc.noaa.gov/news/evaluating-tropical-cyclone-exposure-and-vulnerability

356. UN Department of Economic and Social Affairs, "2018 Revision of World Urbanization Prospects," www.un.org/development/desa/publications/2018-revision-of-world-urbanization-prospects.html.

357. Ulrich Beck, *Risk Society: Towards a new modernity* (London: Sage Publications, 1992).

358. Will Nichols and Rory Clisby, "China's Manufacturing Heartland Most at Risk from Rising Seas," *Verisk Maplecroft* (February 27, 2020), www.maplecroft.com/insights/analysis/chinas-manufacturing-heartland-most-at-risk-from-rising-seas/.

In the attempt to contain population displacement resulting from rising sea levels, governments across East Asia have already started major risk evaluation and undertaken infrastructural investments to readjust cities to risk exposure. In Vietnam, Ho Chi Minh City is planning to spend 345 million US dollars on anti-flood projects, such as a river barrage similar to the Thames Barrier in London that would cover the downtown area and part of the city suburbs.[359] In Japan, after the IPCC report predicted the possible displacement of more than 50 million people, the government steered toward a policy of adaption rather than mitigation.[360] This can be seen by a total of 355 state-funded projects directly aimed at adapting to a warmer future, such as the Metropolitan Area Outer Underground Discharge Channel in Kasukabe, the world's largest underground flood water diversion facility. "Adaptation is not expected to work well without being accompanied by mitigation ... and should only be a supplementary policy to deal with remaining climate risks,"[361] said Kiyoshi Takahashi, a researcher at the National Institute for Environmental Studies in Japan. Indonesia is opting for the more drastic solution of moving its capital to the island of Borneo as Jakarta, the fourth highest risk city in the world according to the Maplecroft report, is slowly sinking as the aquifers it sits above are drained.

China, which is likely to face the highest costs of sea level rise, has become a world leader in green technology development and an outspoken voice in climate change advocacy. This has resulted in increasing research in "Sponge city schemes" that incorporate sustainable drainage systems such as water-absorbing asphalt and green spaces into their infrastructure to prevent water from pooling or scientific research on urban climate phenomena like urban heat island effect and air pollution and their impacts on health.[362] However, as no major policy change aimed at stopping the domestic deregulation and fossil fuel consumption have been taken, and while China continues to be the biggest emitter of greenhouse gas at a rate of 26 percent of global emissions, such endeavors fall in a cornucopian project a "green" economy that heals symptoms without considering the causes.

**Land Reclamation in Singapore**

Singapore has been intrinsically defined by land reclamation since the British colonization of the area. Land terraforming endeavors first took place on a portion of the island's marshland and swamps that provided a fertile ground for indigenous communities to fish mudskippers. As Singapore's proximity to the Strait of Malacca assured a strategic transitionary

359. "HCMC to Spend $ 345 Million on Anti-Flooding Projects This Year," *VnExpress International – Latest News, Business, Travel and Analysis from Vietnam*, VnExpress International, (April 8, 2019), e.vnexpress.net/news/news/hcmc-to-spend-345-million-on-anti-flooding-projects-this-year-3906479.html.

360. Oscar Boyd and Cory Baird, "As IPCC Report Warns of Growing Climate Change Risks, Japan Seeks to Adapt," *The Japan Times* (October 29, 2018), www.japantimes.co.jp/news/2018/10/29/national/ipcc-report-warns-growing-climate-change-risks-japan-seeks-adapt/.

361. Kiyoshi Takahashi, quoted in Boyd and Baird, "Japan Seeks to Adapt."

362. See "Three CUHK Architecture PhD Students' Papers About Healthy City Achieved 'Most Cited Articles' in the Journal of Urban Climate," CUHK Communications and Public Relations Office, www.cpr.cuhk.edu.hk/en/press_detail.php?1=1&id=3298&fbclid=IwAR3mY3AXG4duTUxo7xNA6F2ehCSVtsEq8xLW4t3d1zWBHnjyDjN5Y-WPik8.

region between Asia and the West, the local ecosystems were brutally transformed into stable land in the 1860s to create Boat Quay, a commercial port that would act as trading post of the British Empire.

The colonial narrative that placed Singapore's main function as a nodal point in global shipping routes continues to guide terraforming investments to this day. After obtaining independence in 1965, the city-state of Singapore engaged in colossal land reclamation projects, primarily aimed at real estate expansion and growing port activities. The nation's land area has grown from 581.5 square kilometers in the 1960s to 723.2 square kilometers today, an increase in territory of almost 24 percent. By 2033, the government plans to increase land area by another 100 square kilometers, making the island 30 percent larger than its original size. These new land-masses are created primarily with enormous amounts of imported sand, collected through intensive sand mining processes. In the past twenty years, Singapore has imported a reported 517 million tons of sand, making it by far the largest importer of sand worldwide.[363]

Until 2007, the largest sources of sand imports came from Indonesia, Malaysia, and Vietnam, but as the environmental impacts of sand mining increased, these countries began reporting a depletion of marine life, land-slides, and river erosion, and the erasure of at least twenty-four Indonesian islands since 2005, prompting these countries to restrict or ban the export of sand to Singapore.[364] In other Indonesian islands, such as Riau, experts have reported extensive damage to coral reefs, exacerbated coastline erosion, and the destruction of ocean environments that will take decades to be restored. Today, most of Singapore's sand fill needs are supplied by Myanmar and Cambodia, which have in turn begun to report the devastating effects of the sand trade on local populations.[365]

What has changed from the beginnings of Singapore's colonial terra-forming is the state's importing of land from neighboring countries. In other words, Singapore has "evolved" into perpetuating the colonial dynamics of power that forged it onto other weaker states, this time, however, by a more volatile and opaque form of land theft: sand mining. Commenting on this material and semiotic inversion of colonization, Charmaine Chua suggests that "the national imaginary in which Singapore sustains an articulation of itself as an ever expanding modern, thriving center of trade and digital life literally requires a theft of territory, a theft of land – war by other means – war by means of terraforming."[366] Furthermore, such acts of resource extraction and geoengineering have been legitimized by the very anthropo-genic changes that drive the Anthropocene: "officials have cited sea level change as a primary motivation for raising the level of reclaimed seabeds,

363. UNEP Global Environmental Alert Service, "Sand, rarer than one thinks" (March 2014), see http://wedocs.unep.org/handle/20.500.11822/8665; Kiran Pereira, "Sand mining- the 'high volume – low value' paradox," *Aquaknow* (April 2012), https://aquaknow.jrc.ec.europa.eu/news/sand-mining-high-volume-low-value-paradox.

364. Bill Guerin, "The shifting sands of time — and Singapore," *Asia Times* (July 31, 2003).

365. While the Myanmar Ports Authority officially sanctions these dredging and mining operations, numerous reports from Myanmar news outlets have stated that locals in the Taninthayi Region now face landslides and erosion due to the digging up of the Dawei River Basin. See Andrew Loh, "Singapore's Thirst for Sand Again in the News," *The Online Citizen* (October 20, 2015), http://www.theonlinecitizen.com/2014/04/spores-thirst-for-sand-again-in-the-news/.

366. Charmaine Chua, "Sunny Island Set in the Sea:" Singapore's Land Reclamation as a Colonial Project," Pre-published in the *Funambulist Magazine* May-June 2018.

portraying Singapore as an entropic victim of climate change, even as the sandy bulwarks that ostensibly protect the island from such processes play a key role in exacerbating their effects."[367] Singapore's outward expansion also echoes back onto the interior. Even though land reclamation is ultimately limited by the state's maritime borders, Singapore also plans on building more extensive underground spaces. In effect, what the city-state's "pragmatic" solutions to spatial constraints have ultimately created is a political economy premised on spatial redundancy—a constant need for increase in space.

**The Strait of Malacca**

The Strait of Malacca is a sixty-five kilometer-wide stretch of water between the Malay Peninsula and the Indonesian island of Sumatra. As the shortest shipping route between the Indian Ocean and the Pacific Ocean, the narrow water channel has served for centuries as a strategic passage in global trade routes. Long before the rise of steam power, the predictable patterns of monsoon winds allowed merchants from the Arabian Peninsula, East Africa, Persia, and the Southern Indian kingdoms to reach the strait and its fervent port cities sheltered by the calm waters of the Malay Archipelago. The strait derives its name from the trading port of Malacca (Melaka), located halfway through the strait on the coast of the Malay Peninsula and conveniently sheltered from the trade winds (Melaka was known to voyagers as the "port at the end of the monsoons"). The port of Malacca is in fact located near the conjunction of several wind systems which famously allowed Zheng He's vessels to easily reach the cosmopolitan harbor, a figure that is commemorated in present-day Malacca as an envoy of peace and cultural exchange.


→ Johannes Vingboons, 'Dutch Malacca', ca. 1665. This is an image from the 'Atlas of Mutual Heritage and the Nationaal Archief', the Dutch National Archives. Public domain under a CC-ZERO license.

The growing geopolitical importance of the maritime chokepoint began to attract the attention of European colonizers since in the early sixteenth century. Beginning with the Portuguese, who took Malacca by force from the Malacca Sultanate in 1511 under the leadership of the conqueror Alfonso de Albuquerque and an army of about 1200 men. Lasting 130 years, the Portuguese dominion in Malacca was followed by the Dutch East India Company (VOC), who sieged the Portuguese settlements in 1641 and gained control of the Fortress "A Famosa." After the Anglo-Dutch Treaty of 1824, the Strait of Malacca eventually became part of the British colonial empire, whose presence in the strait had already began with the establish-

367. Ibid.

ment of Singapore just south of Malacca. The treaty's division of the Malay Archipelago into a British zone in the north and a Dutch zone in the south ultimately became the current border that separates Malaysia and Indonesia along the strait.

Linking the Indian Ocean's large reserves of hydrocarbons in India, Iran, and Saudi Arabia to one of the world's largest importers of oil, China, today the Strait of Malacca lies at a nodal point of the supply chain that fuels a carbon-capitalist economy. Of the 97.2 million barrels of crude oil and petroleum products that transit at sea per day, 16 percent pass through the Strait of Malacca.[368] China, which imports over half of its oil, must transit an estimated 80 percent of its imported oil supply through Malacca from Venezuela and oil-rich nations in Africa and the Middle East.[369] The heavy dependence on the strait lies at the heart of maritime security in the People's Republic of China and has been acknowledged among Chinese political leaders as the "Malacca dilemma." Alternative routes that link the South China Sea to the Indian Ocean have proven to be difficult for tankers to navigate due to shallow waters (the Sunda Strait) or too far of a detour to be economical (the Lombok Strait). As acts of piracy, oil spills, and trafficking accidents disrupt trade in the Strait of Malacca, the "dilemma" might be further accentuated by China's recent conflicts with a number of countries bordering the South China Sea, following the PRC's controversial territorial claims. To circumvent these conflicts, China is developing ties to another neighboring state, Myanmar, which will enable Beijing to reach the Bay of Bengal while avoiding the Malacca Strait and the South China Sea entirely. The construction of the Kyaukpyu deep-sea port, which is well underway and represents an initial step in the establishment of the Belt and Road Initiative, is part of this plan.

**Belt and Road Initiative: Silk Road of Geocultural Power**

The People Republic of China's Belt and Road Initiative, launched in 2013, aims to establish new trading routes by further connecting China, Asia, Europe, and Africa along five integrated pathways. This highly contested, long-term initiative envisages the construction of a trade and transport infrastructure network on land ("Belt") and water ("Road") involving nearly 70 countries and accounting for 60 per cent of the world's population. While reviving the historical imaginary of the peaceful cooperation between cultures and nations embodied in the ancient Silk Road, the Belt and Road project clearly aims at reinstating China as a dominant power, one which would aim at reorganizing and transforming whole of Eurasia and beyond. Researcher Jegan Vincent de Paul identifies in "the discursive events and materials of the Belt and Road project [...] the super-narrative of a potential world order."[370] Chinese President Xi Jinping describes it as a "community of common destiny for mankind,"[371] as his vision for transforming global governance.

368. According to the US Energy Information Administration, World Oil Transit Chokepoints 2017.

369. "How Much Trade Transits the South China Sea?" *ChinaPower Project* (October 10, 2019), chinapower.csis.org/much-trade-transits-south-china-sea/#:~:text.

370. Jegan Vincent de Paul, "Transcending History: Considering a Belt and Road Archive," *Allan Sekula: OKEANOS*, ed. Daniela Zyman and Cory Scozzari (Berlin: Sternberg Press, 2017), 261.

371. Liza Tobin, "Xi's Vision for Transforming Global Governance: A Strategic Challenge for Washington and Its Allies," Tex*as National Security Review* vol. 12 (November 2018).

The motivations and financial backing that drive the realization of this trillion-dollar economic and geopolitical ambition position the accumulation of capital as a driver of global ecological deterioration and climate change. Despite President Xi Jinping's claims that BRI will be "green, healthy, intelligent and peaceful" and his invitation for participating countries to "deepen cooperation in environmental protection, intensify ecological preservation and build a green Silk Road,"[372] it's been reported that BRI's major corridors will pass through various ecologically sensitive areas.[373] The planned construction of a hydroelectric dam on the Indonesian island of Sumatra, for example, is meant to power a high-speed rail project that is intended to link the capital Jakarta with Bandung 140 kilometers away. But its construction involves the blasting of a tunnel, the paving of access roads, and flooding of a wide expanse of jungle, which could lead to the extinction of a species of orangutans and to other irreversible damages to the highly diverse Batang Toru ecosystem.[374] While financiers such as the Asian Development Bank and the World Bank's International Finance Corporation deemed this project too ecologically harmful to fund, the state-owned Bank of China stepped in and the project which is scheduled to be completed by 2022.

From a geopolitical point of view, BRI represents China's attempt to further accentuate its own political and economic influence in the world in reaction to a dominant paradigm of Western-centric globalization. To establish this new world-system, China's strategy has also seen the country co-opting its own historical past to facilitate diplomatic relations with current and future BRI partner nations. As suggested by Tim Winter, "Belt and Road is a project in both writing and reading history [...] if BRI is about 'reviving' the Silk Roads for the twenty-first century, we might also ask how China now reads the past, and in what ways it appropriates it for strategic ends."[375] The rhetorical use of history is identifiable in the numerous projects of cultural preservation undertaken by China in BRI partner nations, which include the construction of a Chinese cultural center in Athens dedicated to heritage preservation, underwater archeology, and Olympic culture as well as proposed collaborations around heritage preservation in Myanmar, along with other cases.[376] This narrative of peaceful connections and harmonious dialogue, pushed forward by an embellished history of the Silk Road, is also present in numerous speeches by President Xi, for example, his introduction of the new silk roads in Iran, where the Chinese president introduced the speech by declaring that "I do not feel like a stranger in your ancient and beautiful country, thanks to the Silk Road that linked our two great nations

372. State Council Information Office of the People's Republic of China, "President Xi calls for building 'green, healthy, intelligent and peaceful' Silk Road" (23 June 2016), http://www.scio.gov.cn/32618/Document/1481477/1481477.htm.

373. The report has found that BRI's corridors overlap with the range of 265 threatened species including saiga antelopes, tigers, and giant pandas; BRI corridors also overlap with 1,739 important bird areas or key biodiversity areas and forty-six biodiversity hotspots or Global 200 Ecoregions. See https://www.wwf.org.hk/en/?19680/Feature-Story-WWF-and-Greening-the-Belt-and-Road-Initiative.

374. "Exploring the Environmental Repercussions of China's Belt and Road Initiative" EESI, 2018, https://www.eesi.org/articles/view/exploring-the-environmental-repercussions-of-chinas-belt-and-road-initiativ.

375. Tim Winter, "Silk Roads and Cultural Routes," e-flux Architecture: New Silk Roads (February 2020), https://www.e-flux.com/architecture/new-silk-roads/313107/silk-roads-and-cultural-routes/. See also Winter, *Geocultural Power: China's Quest to Revive the Silk Roads for the Twenty First Century* (Chicago: University of Chicago Press, 2019).

376. Winter, *Geocultural Power.* Also Winter, "Heritage Conservation Futures in an Age of Shifting Global Power," *Journal of Social Archaeology* vol. 14, no. 3 (2014): 319–39.

for centuries and to the many legendary stories recorded in history books of our friendly exchanges. Over 2,000 years ago, during the West Han dynasty in China, the Chinese envoy Zhang Qian's deputy came to Iran and received a warm welcome."[377]

→ The Maritime Silk Road Museum of Guangdong. Under the CC Attribution-Share Alike 4.0 International license.

As suggested by You Mi, the political-philosophical paradigms that guide China's manufacturing of its future seem to stem from a Confucian cosmological order, a Sinocentric *Tianxia* (under-heaven) philosophy of co-existence and conflict resolution. The dubious, yet successful, marriage between advanced capitalism and traditionalist Confucianism began with Deng Xiaoping's economic reforms and open-door policy in the 1970s. You specifies that the success of China's economic transition in fact "owes to remnants of Confucianism with a certain feudal connotation," where feudalism is not to be understood as a backward form of governance, "but one that affirms the distribution of power and local rule, at the same time bound by the Confucian concept of *da yitong* — a common pursuit/respect for unity — effectively creates what can be called Confucian Capitalism."[378]

**Asian Brown Clouds**

A 1999 international research effort, the Indian Ocean Experiment (INDOEX), discovered high levels of air pollution across an extensive area of more than 10 million square kilometers and reaching a height of three kilometers. A United Nations report published in 2002 in response to the INDOEX discovery coined the term "Asian brown cloud" to describe this haze of pollution built up during the winter monsoon months over South Asia, particularly the northern Indian Ocean, Bay of Bengal, and the Arabian Sea. The report generated some debate around the spatial extent of pollution, its seasonality, and its impact on climate. As a result, the term "atmospheric brown cloud" is now commonly used in reference to the layer of air pollution attributed to widespread industrialization, composed of myriad aerosols and gases. These include natural aerosols from volcanic activity, dust, and sea spray, as well as anthropogenic aerosols produced by the combustion of fossil fuels, biofuels, and biomass. Volatile organic compounds, black carbon, and nitrogen oxides absorb short wavelength solar radiation, which produces the brown hue of the cloud and leads

377. Xi Jinping, "Work Together for a Bright Future of China-Iran Relations," January 2016. See other example in Winter, *Geocultural Power*.

378. You Mi. "Chinese Globalization, Confucian Capitalism, and Transnationalism?" *Mezosfera.org*, Oct. 2017, mezosfera.org/chinese-globalization-confucian-capitalism-and-transnationalism/.

to solar dimming on land. The enhanced ozone concentrations at lower atmospheric levels directly damage human respiratory functions and crop yields.

As population increase and industrialization continue in India and China, the complexity of the climate and hydrological relationships between atmosphere, ocean, and land makes it difficult to resolve the impacts produced by the chemical components of brown clouds. Their mobile nature also challenges modeling efforts to incorporate their influence on climate trends, as pollutants produced in one region travel to impact another. While the absorption of sunlight by the high aerosol content, particularly by black carbon, reduces solar heating of the Indian Ocean, it enhances the heating of the atmosphere, which produces knock-on effects to the hydrological cycle, both locally and further afield, as pre-monsoon and monsoon regimes across Asia are altered, in addition to land-sea thermal patterns. Meanwhile, modeling implies that the clouds decrease the oxidizing power of the atmosphere, which increases the lifetime of methane—a powerful greenhouse gas—thus accelerating climate change. A deeper understanding of brown clouds is needed to quantify their effects on the earth's energy budget.

Text by Fiona Middleton

↑ Haze over the Bay of Bengal, satellite image from January 27, 2007. Sundarbans mangrove forest visible in image centre. Photo: NASA Earth Observatory, image not licensed, freely available for use according to Nasa's image use policy

**Ecocide along the Pacific Ring of Fire: West Papua**

West Papua is located along the Pacific Ring of Fire, the geological zone that encircles the Pacific Ocean basin from the Melanesian islands to the Philippines, the Kamchatka Peninsula, the US Pacific coast, Mexico, Central America, and to the Andes mountains. Also known as the Circum-Pacific Belt, the Ring of Fire demarcates a nearly continuous series of oceanic trenches, volcanic arcs, volcanic belts, and plate movements where 90 percent of the world's earthquakes occur. The zone also represents vast mineral deposits of copper, gold, zinc, tin, mercury, uranium, and other rare-earth metals, which are subject to exploitation by numerous multinational companies.

→ Grasberg mine, West Papua, undated. Ahmed Nabil, Land Rights / Counter Mapping West Papua pic 03. Photo courtesy: TAPOL Archives.

The exploitation of Indonesia's mines began with the colonialization of the region by the Dutch East India Company. During the colonial period, which lasted for over 350 years, the Dutch held all mining rights until Indonesia gained independence in 1945.[379] At the time, West Papua remained under Dutch administration, which led to several Indonesian military interventions in the region. In 1962, Indonesia and the Netherlands eventually signed the New York Agreement, which temporarily transferred the territorial administrative rights of the region from the Netherlands to the United Nations Temporary Executive Authority under the condition that by 1969 the latter would oversee a referendum in which the Papuans could choose whether they would like to become part of Indonesia or to form an independent state. The Act of Free Choice was issued in 1969, however, the plebiscite, also known in West Papua as the "Act of No Choice," was compromised since the Indonesian military selected a little more than a thousand delegates to vote in favor of Indonesian control on behalf of the entire West Papuan population. The referendum was nonetheless recognized by the international community and West Papua became an Indonesian province. In

379. The policy was gradually relaxed due to pressures from the private sector to include the Netherlands Indies (present-day Indonesia) and the increased need for coal in the 1850s. As a response, the colonial government created a Special Committee for Mining in 1852, which later became the Colonial Mining Office (Dienst van het Mijnwezen). The main task of this organization was to conduct geological exploration in several areas expected to have coal deposits. Mirza A. Karim and Karen Mills, "Indonesian Legal Framework in the Oil, Gas, Energy and Mining Sectors; Including Dispute Resolution," *Journal of World Energy Law & Business* vol. 3, no. 1 (2010) https://arbitrationlaw.com/sites/default/files/disputes_in_the_og_sector-indonesia.pdf.

the years that followed, West Papua saw a decade-long political movement for the right to self-determination against the claims of the Indonesian state and the military violence that ensued. Reports such as the Asian Human Right Commission's "Neglected Genocide" have provided detailed evidence that the series of atrocities conducted by the Indonesia in West Papua amount to genocide as defined by international law.[380]

Central to this conflict is the exploitation of the Grasberg mine in West Papua, on the Melanesian section of the Pacific ring. Since the 1970s, the third-largest gold and copper mine in the world has been heavily exploited by the US-based transnational company Freeport McMoran Inc. As a result of intense mining, vast quantities of toxic waste have been dumped directly to the Aghawagon and Ajkwa rivers, damaging several ecosystems.

The team of interdisciplinary researchers that constitute the project Inter-Pacific Ring Tribunal (INTERPRT), founded by spatial researcher Nabil Ahmed and commissioned by TBA21–Academy, has produced extensive research on the environmental crimes linked to the Freeport McMoran's mining activities in West Papua. INTERPRT is part of the global campaign to make ecocide an international crime and works at the intersection of spatial analysis and international law to describe precedents for the proposed international crime. INTERPRT has been gathering spatial evidence of Freeport's crimes against nature in West Papua, ranging from widespread destruction of tropical rainforests and river systems to the contamination of coastal areas in the territory of the Kamoro people between 1984 and 2014. The analysis combines publicly available remote-sensing imagery with photographs taken near and within the sites in question. The wide time span and territorial cover consider the "spatially diffused and temporally protracted"[381] nature of ecocide, providing verified evidence of the longstanding environmental damage caused by the dumping of mine tailings into the Ajkwa River and estuary.

**Polynesian Voyagers**

Polynesian navigation is based on the observation of the sun, the moon, star charts, oceanic waterways, and cloud formation (which can help localizing landmasses during suitable weather conditions). This vast knowledge, which has been passed on by oral tradition for hundreds of generations, has allowed Polynesian voyagers to understand the ocean as a series of pathways rather than an obstacle to be dominated and tamed.

The voyages are thought to have begun in 1500 BCE, when Polynesians first set sail from Southeast Asia into the Pacific Ocean. Between about 3000 and 1000 BCE, Austronesian communities spread throughout the islands of Southeast Asia—almost certainly starting out from Taiwan, as communities whose natives were thought to have previously arrived from Mainland South China about 8,000 years ago—into the edges of western Micronesia and on into Melanesia.

380. See Asian Human Right Commission 2015 report: "The Neglected Genocide – Human rights abuses against Papuans in the Central Highlands, 1977 – 1978." http://alrc.asia/wp-content/uploads/2015/09/AHRC_TheNeglected_Genocide-lowR.pdf

381. Nabil Ahmed, "Ground Truth: The Case of Ecocide in West Papua," in *Alan Sekula: Okeanos*, edited by Daniela Zyman, Sternberg, 2017.

Polynesian trans-oceanic explorations largely predate European ones, and the Polynesian knowledge of the oceans highly differs from a Western framing of science. In the words of Fealofani Bruun, the first Samoan woman to qualify as a yachtmaster who has been actively involved in the preservation of Polynesian navigation, the traditional Polynesian affinity with the ocean "is cultural, spiritual, cosmological and cosmogenical. It could be considered a type of ethno-science, but it doesn't equate to a Western science; it's embedded; it's multi-dimensional. And all of that is evident on the ocean, in learning how our ancestors built these canoes and in learning how to navigate on the open ocean. The more I learnt about traditional navigation, the more comprehensive and defined things became in adapting it to everyday life. And as I did, I have come to see the beauty of my culture, the beauty of the people around me, the beauty of my roots and the wisdom of our ancestors."[382]

By the twentieth century, traditional Polynesian voyaging knowledge was virtually lost, with only a few "wayfinding" navigators alive in the Caroline Islands. But in the 1970s, this knowledge saw a renaissance in Hawaii, thanks to the Polynesian Voyaging Society, who built the first voyaging canoe in more than 600 years. The continued preservation of these traditions, currently taken on by figures such as Bruun, prompts the question of how acts of cultural restoration can restore new ecologies of belonging to the oceans that differ from the violent paradigms of navigation and territorialism.

→ Venerable Polynesian voyaging canoe Hawai'i Loa at sea off Waikiki, Honolulu, June 2017. Photo: Joel Abroad. Under CC BY-NC-SA 2.0 license.

**The Nine-Dash Line**

The South China Sea is an area that attracts strategic, political, and economic interest. About a third of global shipping trade transits through this semi-enclosed sea, which is also rich in resources, with oil reserves equivalent to an estimated 11 billion barrels of oil, 190 trillion cubic feet of natural gas, and 10 percent of the world's remaining fisheries.

382. Interview with Fealofani Bruun, "Fealofani Bruun on Traditional Navigation," Para Site Hong Kong, https://www.para-site.art/programme/fealofani-bruun-on-celestial-navigation/.

In recent years, this vast maritime region has been the site of episodic military disputes, particularly concerning the transformation of islands into permanent naval bases. Taiwan, Vietnam, the Philippines, Malaysia, and Brunei lay claim to parts of the South China Sea through their respective EEZs, whilst the People's Republic of China argues it has historical claims to a much vaster section of the South China Sea than its EEZ would suggest. Since the mid 1990s, China has been conducting several maritime archeological operations to prove its historical rights over the Paracel and Spratly islands.[383] The total territory claimed by China is identified by the nine-dash line, which ignores UNCLOS legislation and encompasses about 90 percent of the South China Sea, including international waters between the respective EEZs of the surrounding countries. China is also initiating land reclamation projects in the Paracel and Spratly islands, constructing artificial islands, which has led to diseases in fish colonies and has affected other marine life, including fish, sea turtles, and sea mammals.[384]

→ SOUTH CHINA SEA (March 15, 2020) Ships from the Theodore Roosevelt Carrier Strike Group and the America Expeditionary Strike Group transit the South China Sea. Photo: U.S. Navy photo by Mass Communication Specialist 3rd Class Nicholas V. Huynh. Under CC BY-NC 2.0

A Pentagon report declared that the claimed nine-dash line includes more than 3,200 acres of land in the South China Sea.[385] From 2015 onward, China accelerated land reclamation and infrastructure construction at its outposts in the Spratly Islands, a remote cluster of islands and underwater reefs located at the center of the disputed sea. Parts of these islands have also been claimed by Vietnam, Malaysia, and the Philippines, but China has already begun to militarize the islands to gain greater control over the maritime region. "When complete, these outposts will include harbors, communications and surveillance systems, logistics facilities, and three airfields. Although artificial islands do not provide China with any additional territorial or maritime rights within the South China Sea, China will be able to use its reclaimed features as persistent civil military bases to enhance its presence in the South China Sea significantly and enhance China's ability to control the features and nearby maritime space,"

383. Xuechan Ma, "Historic Title Over Land and Maritime Territory," *Journal of Territorial and Maritime Studies* vol. 4, no. 1 (Winter/Spring 2017): 31–46.

384. John W McManus, "Offshore Coral Reefs and High-Tide Features of the South China Sea: Origins Resources, Recent Damage and Potential Peace Parks," *In the Wake of the Arbitration: Papers from the Sixth Annual CSIS South China Sea Conference*, ed. Murray Hiebert (CSIS Center for Strategic and International Studies, 2017), 137–139.

385. US Department of Defense. "Military and Security Developments Involving the People's Republic of China 2016", https://dod.defense.gov/Portals/1/Documents/pubs/2016%20China%20Military%20Power%20Report.pdf.

the report reads. Three of the land features in the Spratly Islands now have 3,000-kilometers-long runways and large ports in various stages of construction.

In 2020, as the Covid-19 pandemic significantly lowered US Navy presence in the South China Sea, China took the opportunity to tighten its aggressive control over the disputed maritime region.[386] In April 2020, a Vietnamese fishing boat was reportedly sunk by a Chinese surveillance vessel, augmenting geopolitical tensions with the US and neighboring South Asian nations.[387] Shortly after the event, China established two additional administrative districts that take in the Paracel and Spratly islands. The new Xisha and Nansha districts fall under the control of Sansha city, which administers islands and reefs currently occupied by Vietnamese citizens and military. As reported by Trinh Le in *The Interpreter*, these events were accompanied by the release of "official" names and coordinates for eighty of the islands, reefs, seamounts, shoals, and ridges by China's Ministry of Natural Resources and Ministry of Civil Affairs.[388]

The South China Sea lies above a drowned and compressed continental shelf that forms a concatenation of shallow waters, deep canyons, and trenches. The atolls in question barely surface the sea, with an elevation of just a meter or two above sea level when they are not submerged by high tides and storms.[389] Perhaps the most startling aspect in the hostile debates around land reclamation and militarization of these quasi-submerged archipelagos is the total abdication of the impact that sea level rise will have on these terraforming speculations.

**Tiger Economies**

Decades before they were dubbed by Western media as the "Four Asian Tigers," the economies of South Korea, Taiwan, Hong Kong, and Singapore were first described as "flying geese," fanning out behind Japan, a former colonizer of all four countries. From the early 1960s and until the 1990s, these four economies underwent rapid urbanization and maintained exceptionally high levels of economic growth, ultimately earning the name "Tiger economies" and bypassing Japan in terms of per capita GDP. Reports have shown that in that period the four economies regularly achieved double-digit growth until they were recognized as high-income economies by the twenty-first century (Singapore had bypassed the US GDP per capita in the 1990s, while Hong Kong drew level in 2013).[390]

The Four Tigers' economic growth was and remains city-led, with Export Processing Zones (EPZs) adopted initially as a vehicle to channel a

386. "Autocrats See Opportunity in Disaster," *The Economist* (April 23, 2020).

387. Huileng Tan, "As China's cases dwindle, Beijing strives to take the lead in the coronavirus crisis", *CNBC*, April 3rd, 2020.

388. Le, Trinh. "Troubled waters: China's sovereign ambition in the shadows of Covid-19", *The Interpreter,* April 27, 2020. https://www.lowyinstitute.org/the-interpreter/troubled-waters-china-s-sovereign-ambition-shadows-covid-19

389. The MAP Office, "The South China Sea Monument", *e-flux Architecture* (May 2019), https://www.e-flux.com/architecture/at-the-border/325758/the-south-china-sea-monument/.

390. "After half a century of success, the Asian tigers must reinvent themselves," *The Economist* (December 5, 2019), https://www.economist.com/special-report/2019/12/05/after-half-a-century-of-success-the-asian-tigers-must-reinvent-themselves

range of consumer goods to the world market under tax relief regimes.[391] Production began to follow the needs of globalized consumption patterns and the demand of "modern" products ranging from IT services to nuclear warheads.[392] While the entrance of Asia into the global market was felt more considerably when China adopted an open-door policy in 1978 and when India lowered tariff barriers which had hitherto kept multinational corporations at bay, the Four Tigers pioneered such strategies of deregulation and had already connected their economy to Western investment. In fact, Taiwan (in 1966), Singapore (1969), and South Korea (1970) where among the first economies in Asia to establish EPZs,[393] which led governments to develop labor-intensive, export-oriented industries. These precocious agents of a rising decentralized global economy provided the models that Chinese policymakers will later attempt to emulate, as shown by Deng Xiaoping's reforms and the proliferation of Special Economic Zones (SEZs) along China's coasts.


→ Fuzhou Export Processing Zone. Photo: rheins. Under CC BY 3.0 license.

When the 1997 Asian financial crisis hit the Tiger economies, China, which was less affected even though it had followed their lead, became the new center of Asian economic gravity. From that moment on, the Four Tigers have gradually depended on balanced ties between the US and China in efforts to maintain a geopolitical calm as the US adjusted to a new rival. Hong Kong and Singapore, for example, have positioned themselves as financial bridges between China and the world, making both highly sensitive to China's economic patterns. A "new cold war" between China and the US would shake the foundations of the Tigers' prosperity and security.[394]

391. See Antoine and Dimitri Germidis, *Investing in free export processing zones*, (Paris: OECD), 1984, and Ashok Kundra, ed., *Asia's export processing zones and science parks in global markets* (Tokyo: Asian Productivity Organization, 200).

392. Robert Bradnock and Glynn William, eds., *South Asia in a Globalising World* (London: Routledge, 2014/2002).

393. United Nations Conference on Trade and Development Report – Chapter IV: Special Economic Zones, East and South East Asia: https://unctad.org/en/PublicationChapters/WIR2019_CH4.pdf.

394. "The Asian tigers must reinvent themselves," *The Economist.*

While the nature of the Four Tigers' economic success is subject to debate among scholars and economists, such discussions remain incomplete if the four economies' obvious distinctions are unaccounted for: While Hong Kong and Singapore are metropolitan areas, Taiwan and South Korea are medium-sized countries; Taiwan and South Korea have democratic governments, while Hong Kong is a Special Administrative Region of China and its autonomy is under threat, as evidence by the ongoing protests there, and Singapore's government has significant control, with a center-right political party that has been in power continuously since 1959; last, South Korea and Taiwan share an export-driven model focused on technology, while Hong Kong and Singapore are now high-end financial centers and service providers.

**The Lanyu Nuclear Waste Storage Site**

Lanyu Island, also known to its indigenous Tao community as *Ponso no Tao* ("the Island of the People") or in English as Orchid Island (by the calque of its Chinese name 蘭嶼), is a volcanic island located off the southeastern coast of Taiwan. The Tao, or Yami, people, are an Austronesian ethnic group that make up the majority of the island's population. Heavily reliant on fishing in an island that is often washed by the strong waves of the South China Sea, the Tao people's culture reflects an intense connection to the sea and human vulnerability to the waters' unpredictability. This is recognizable in shamanistic practices such as the traditional hair dance, in which women sway their hair up and down for the waves to carry their men safely back from the ocean.


→ Anti-nuclear protest in Lanyu Pongso no Tao. Unknown author. Under CC BY-NC 2.0 license

In 1978, the state-owned Taiwan Power Company (Taipower) began to construct a nuclear waste storage facility, initially disguised as a fish cannery, on the southeastern coast of the island. The storage facility was built without the consent of the island's inhabitants or even prior consultation with them. Although the initial plan to dump waste directly into deep ocean trenches adjacent to the island was abandoned after the 1993 Amendment to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, low-level nuclear waste was still sent to the island and it was alleged that workers were permitted to release liquid

radioactive waste into the surrounding environment.[395] The Lanyu storage site has been receiving nuclear waste from Taiwan's three power plants since 1982, and it now houses nearly 100,000 barrels of radioactive waste. The high concentration of nuclear waste has led to increasing numbers of cancer-related deaths among the island population, and several disabilities have been registered. Taiwan's National Health Statistics indicates that the Lanyu island has the highest cancer death rate in the country.[396]

The Tao community has been actively involved in anti-nuclear protests and campaigns since 1988. Led by Kuo JIan-ping, a Tao Presbyterian missionary, and with the support of other anti-nuclear activists, demonstrations have been held in both on Lanyu island and in Taipei. The group then submitted a letter to the Taiwan Power Company demanding the immediate cessation of the expansion of the nuclear waste storage site and the transport of nuclear waste from Taiwan to Lanyu Island, along with the shutdown of the storage site by June 30, 1991. The first request was met, but the facility continues to receive low-level radioactive solid waste from nuclear power plants, medical, agriculture, industrial, education, and research sectors in Taiwan on a weekly basis.[397] While protests led by the Tao people in cooperation with other local environmental movements in Taiwan continue to fight the indiscriminate deposition of nuclear waste on Lanyu Island, other campaigns have succeeded in either halting or slowing down a number of recent corporate global industrial projects including the Fourth Nuclear Power Plant near Taipei, mega dam projects in central and south Taiwan, petrochemical industry projects, and a Miramar Resort Village project.

**The Sinking Pearl River Delta**

The Pearl River Delta (PRD) is the low-lying area surrounding the Pearl River estuary, where the Pearl River empties its fresh waters into the South China Sea. About 3,720 square kilometers of the PRD is less than two meters above sea level, and yet, it is one of the most densely urbanized regions in the world. The PRD is in fact a megalopolis, a metropolitan cluster made of the cities of Guangzhou, Shenzhen, Zhuhai, Foshan, Dongguan, Zhongshan, Jiangmen, and parts of Huizhou and Zhaoqing. Since the introduction of the "socialist market economy" and "open door" policy by former Chinese President Deng Xiaoping in 1978, the PRD has been host to China's biggest and most dynamic Special Economic Zones (SEZs). From the outset, Chinese development policies focused especially on coastal regions, leading to towns and fishing villages being absorbed into a mega-urban area. From what was mostly farmland a generation ago, the PRD has become an industrial superpower with a population exceeding 42 million.

Sociologist Saskia Sassen suggests that the introduction of such extreme zones for key economic operations have triggered profound transformations that are producing systemic inequalities, or contempo-

395. Gloria Kuang-Jung Hsu, "Control or Manipulation? Nuclear Power in Taiwan," *Learning from Fukushima: Nuclear power in East Asia*, Peter Van Ness and Mel Gurtov, eds., (Canberra: Australian National University, 2017).

396. I-jun Chiu, Hsiu-ting Wang, and Ly-zen Liu, "Orchid Island has the highest cancer death rate in Taiwan," *Liberty Times* (June 2013).

397. I-fan Lin, "Taiwan: Nuclear Waste on Orchid Island," *Global Voices* (March 2011).

rary logics of "expulsion" as she defines them, that do away with obsolete conceptual superstructures such as capitalism versus communism.[398] "At the one end," says Sassen, "[the SEZ] takes the form of global outsourcing of manufacturing, services, clerical work, the harvesting of human organs, and the raising of industrial crops to low-cost areas with weak regulation. At the other end, it is the active worldwide making of global cities as strategic spaces for advanced economic functions; this includes cities built from scratch and the often brutal renovation of old cities. The network of global cities functions as a new geography of centrality that cuts across the old North-South and East-West divides, and so does the network of outsourcing sites."[399]

→ Bao Ti Metro Station construction Bao'an Shenzhen. Photo: Chris. Under CC BY-NC 2.0

Fukushima Daiichi Nuclear Disaster

In effect, the deregulation of environmental protection and labor in favor of privatization, foreign investment, and rapid urbanization implied by SEZs, have transformed the PRD into a dense urban landscape built on bulldozed land. These areas are mainly composed of factories, high-rise housing, and hotels crowded along massive freeways. The pretext of "infinite growth" that underlines such forms of deregulation has led to intensive land reclamation activities and land subsidence, which make the PRD even more vulnerable to anthropogenic and natural environmental shifts, and particularly to sea level rise. Several studies have shown that most of the world's low-lying deltas are sinking from anthropogenic activity. The sinking of deltas results from a combination of four dominant factors: sediment compaction from the removal of oil, gas, and water from the delta's underlying sediments, the trapping of sediment in reservoirs upstream, and floodplain engineering in combination with rising global sea level.[400] In the case of the PRD, the delta is at risk due to excessive extraction of underground water and its geological structure. This has been further developed in a recent study led by several oceanographers who have gathered navigational and bathymetric data dating back 165 years, as well as sixty years' worth of sediment discharge data to document and explain

398. Saskia Sassen, *Expulsions: Brutality and Complexity in the Global Economy*, (Cambridge, MA: Harvard University Press, 2014).

399. Ibid.

400. James P. M. Syvitski et al., "Sinking Deltas due to Human Activities," *Nature Geoscience*, Vol. 2 (September 2009).

the geomorphic changes of the PRD and its estuary due to anthropogenic activities.[401] The study concludes that with decreased sediment supply and accelerated sea level rise, the PRD may well begin to experience land loss and coastal inundation in the not-too-distant future.

As in other urbanized deltas in the world, the PRD's vulnerability to sea level rise is further accentuated by the eradication of the mangroves that once populated the coast, acting as a natural protecting barrier from the impact of waves and rising sea level while also providing other vital functions, such as absorbing carbon, filtering out salt that might infiltrate freshwater reserves, and lowering ambient temperatures.

→ IAEA decommissioning team members walk past tanks that store contaminated water. Fukushima Daiichi, 1 February 2015. Photo: Susanna Loof / IAEA. Under CC BY 2.0 license.

The coastal cities that make up the megalopolis of the PRD are already beginning to face the destructive impacts of climate change. In 2016, heavy rains inundated entire neighborhoods, killing more than 160 people by drowning and landslides, in addition to destroying 73,000 homes and more than a million acres of farmland.[402] As is often the case with environmental disasters, the destructive impacts were further accentuated by the infrastructure of overdevelopment: the canals and waterways that once helped drain cities like Guangzhou have been paved over, thus blocking the outflow of heavy rains. However, as the PRD represents a trillion-dollar investment at high risk of economic loss from climate change, China has become a major voice on the topic and a world leader in its domestic investment in renewable energy—a reputation it has earned in little more than a decade. At the 2017 World Economic Forum, China's president Xi Jinping urged all signatories of the Paris Agreement to follow through their commitment, while state-run Chinese media has criticized the Trump administration for dodging its responsibility on climate change. However, despite such declarations, no direct action has been taken to stop the kind of rapid

401. Ziyin Wu et al., "Geomorphologic Changes in the Lower Pearl River Delta, 1850–2015, Largely due to Human Activity," *Geomorphology* (May 2018). For more on how land subsidence is associated with rapid urban development, see also Tim Hua Wang et al., "InSAR reveals coastal subsidence in the Pearl River Delta, China," *Geophysical Journal International* vol. 191, issue 3 (December 2012): 1119–1128, https://doi.org/10.1111/j.1365-246X.2012.05687.x

402. Michael Kimmelman, "Rising Waters Threaten China's Rising Cities," the *New York Times* (April 7, 2017), https://www.nytimes.com/interactive/2017/04/07/world/asia/climate-change-china.html.

expansion and deregulation that happened at the PRD, and China continues be responsible for the greatest rate of greenhouse gas emissions in the world, producing 26 percent of global emissions.[403]

**Fukushima Daiichi Nuclear Disaster**

In 2011, an undersea megathrust earthquake, with a magnitude of 9.1 Mw, took place off the Pacific coast of Tōhoku in Japan. Also known as the "Great East Japan Earthquake" (東日本大震災), it was one of the most powerful earthquakes registered in modern history. With a hypocenter at an underwater depth of approximately twenty-nine kilometers, the earthquake triggered a devastating tsunami which took the lives of more than 15,000 people.

The Fukushima Daiichi Nuclear Power Plant was severely damaged by the impact of the tsunami. Seismic sea waves penetrating the plant shut down energy supplies, which caused a chain of events leading to overheating, explosions, and the release of radioactive materials into the atmosphere and the ocean. The tragic event, which displaced more than 100,000 people from homes that had become uninhabitable due to the radioactive fallout, is believed to be the worst nuclear catastrophe at a nuclear power plant since the 1986 Chernobyl disaster.

The common description of the Fukushima Daiichi Nuclear Disaster as a "disaster" requires reconsideration, since it's a terminology that may lead to an understanding of the gravity of the event as purely accidental, and the affected environment and people as victims of an "unaccountable hazard." Modern ecological disasters are in fact hybrid phenomena, a meeting of natural, technical, and political causes. These "accidents" are, to some extent, produced or amplified by a form of governance that dominates the current paradigm of industrial production. As Ulrich Beck writes in *The Risk Society: Towards a New Modernity*, "the risk society is characterized essentially by a *lack*: the impossibility of an *external* attribution of hazards. In other words, risks depend on decisions; they are industrially produced and in this sense *politically reflexive*."[404] Writer Jason Waite, who visited the remains of the nuclear power plant, confirms this point as relates to Fukushima: "Part of a military-industrial complex that descended from the Manhattan project, Fukushima Daiichi had a built-in destructive capacity. The site selected for the plant was on a bluff next to the Pacific Ocean that had a former WWII airbase used to train Kamikaze pilots. This nationalist necropolitics extended into corporate extractivism when Tokyo Electric Power Company dramatically lowered the rocky plateau, which would have a been a natural barrier against tsunami, in order to save money on the transportation of material and lower operating costs."[405] The politics of negligence that ignore contingency in favor of profit maximization made the site and surrounding communities more pre-

403. Mengpin Ge and Johannes Friedrich, "4 Charts Explain Greenhouse Gas Emissions by Countries and Sectors," *World Resources Institute* (February 06, 2020), https://www.wri.org/blog/2020/02/greenhouse-gas-emissions-by-country-sector.

404. Ulrich Beck, *Risk Society: Towards a New Modernity*, (London: Sage Publications, 1992 [1986]), 183.

405. Jason Waite, "The Entropic Silence of Fukushima," *Matter Fictions*, ed. Margarida Mendes (Berlin: Sternberg Press, 2017), 117.

carious. Catastrophes are constituted by a convergence of anthropogenic changes wrought by the abdication of contingency and the imagining of a future.

If such "disasters" are the consequence of a privatized temporal myopia driven by negligence, it is important to note that their catastrophic aftermaths are also subject to privatization. To return to Beck, "[Modernity] has become the threat and the promise of emancipation from the threat that it creates itself."[406] In the case of Fukushima—where the welfare of the inhabitants of the areas surrounding Fukushima Daiichi was profoundly affected by the event, costing them their homes, health, and jobs—it was the Tokyo Electric Power Company (TEPCO, owner of the power plant) that became responsible for the locals, providing affected individuals with compensation for the loss of jobs and homes. Waite writes, "While the welfare of a population is usually the concern of the state, here the contamination effectively produced an amalgamated territory of private dominion. Radioactive nuclides fused with atoms of capital. This contamination set in motion a dual process of community privation and the privatization of individual well-being."[407]

↑ Whether station on Troynoy, Izvesti Tsik Islands, Great Arctic Reserve, Russia, July 1993. Photo: GRIDArendal. Under CC BY-NC-SA 2.0 license.

406. Beck, *Risk Society*, 184.
407. Waite, "The Entropic Silence of Fukushima," 119.

**Geopolitics of Arctic Melt**

In recent years, the Arctic region has become the object of intensified capitalist re-valorization. The region is no longer portrayed as an untamable wilderness, but rather presented as a territory for exploit, full of enormous untapped resources. The accelerated melting of the Arctic ice has created the opportunity and environmental conditions which allow access to the "new frontier" of capital accumulation. A permanently navigable Northwest Passage (through North America) or Northern Sea Route (over Eurasia) would significantly shorten existing shipping routes and circumnavigate the chokepoints of the Strait of Hormuz, the Gulf of Aden, or the Strait of Malacca. According to some estimates, "these shortcuts could cut the cost of a single voyage by a large container ship by as much as 20 per cent – from approximately 17.5 million to 14 million dollars – saving the shipping industry billions of dollars a year."[408]

The prospect of an ice-free passage has made the questions of legal status particularly relevant. Canada considers the Northwest Passage to be part of its internal waters, whereas most maritime nations, including the United States, consider it to be an international strait, which allows the right of passage. Russia considers portions of the Northern Sea Route east of Novaya Zemlya to the Bering Strait within its Arctic EEZ, meaning ships will pass through Russian territorial and internal waters.

In 2007, a Russian flag was planted on the Arctic seabed below the North Pole, directly on the 1500-kilometers-long Lomonosov Ridge which divides the Arctic Ocean into the Eurasian and Amerasian basins. Triggering an international outcry, the Russian tricolor became a symbol for what has been labelled the "Geopolitics of Arctic Melt." This concept frames the new geopolitical interest in the region, which changed "from one of primarily scientific and environmental concerns into a maelstrom of competing commercial, national security and environmental concerns."[409]

Until 1999, the geographic North Pole and most of the Arctic Ocean had generally been considered an international space, including both the waters and the sea bottom. However, the United Nations Convention on the Law of the Sea (UNCLOS) has prompted Denmark (in 2014), Russia (in 2001), and Canada (in 2019) to submit competing claims or to reinforce preexisting claims to portions of the seabed of the polar region. The UN's Commission on the Limits of the Continental Shelf is empowered to assess whether areas of the seabed meet a series of bathymetric and geological criteria which can permit coastal states to claim exclusive rights to the non-living resources of the seabed, beyond 200 nautical miles from coastal baselines. According to international law expert Michael Byers, each of these nations is scientifically correct when it asserts that its continental shelf extends beyond the North Pole. "All three countries' scientists take the view that it is the same continental shelf all the way around the ocean, because North America used to be part of the same continent as Eurasia," he explains.[410]

408. John Vidal, "Arctic ice shrinks 18% against record, sounding climate change alarm bells," The Guardian (September 19, 2012).

409. Charles K. Ebinger and Evie Zambetakis, "The Geopolitics of Arctic Melt," *International Affairs* vol. 85, no.6, (October 2009): 1215–1232, 1215.

410. Tom Metcalfe, "Canada Makes a Claim to the North Pole," *Live Science* (June 7, 2019), https://www.livescience.com/65659-canada-claims-north-pole.html.

Along the new Artic frontier, the race for control over resources (minerals, including gold, diamonds, and rare-earth metals, as well as petroleum, natural gas, and fish) and access to the new shipping lanes has intensified. Russia and Norway have been the most active Arctic nations, investing in natural gas and oil infrastructure, deep-water ports, and ships capable of navigating the Arctic Ocean's waters. Half a million Russians live in the country's largest Arctic cities Murmansk and Norilsk. Meanwhile, China has been backing Russian gas projects, offering development loans to other Arctic nations, and building a fleet of icebreakers. China's bilateral relations with polar states fall in line with its strategic interest in building a "Polar Silk Road" connecting Asia, North America, and Europe.[411] This update to China's Belt and Road Initiative was announced in a 2018 white paper in which China dubbed itself a "near-Arctic state," and that therefore the "natural conditions of the Arctic and their changes have a direct impact on China's climate system and ecological environment, and, in turn, on its economic interests in agriculture, forestry, fishery, marine industry and other sectors."[412] While Sino-Russian cooperation in the Arctic currently provides a mutually beneficial arrangement for both sides, where Russia possesses the geographic proximity and expertise to develop the northern sea route and China possesses the economic means to support such an endeavor, the long-term equilibrium of their relationship might change due to China's superior economic standing and its increasing influence in the Arctic.[413]

The Arctic territory is dotted by numerous military bases, airfields, refueling stations, and a NATO base. In April 2017, the Russian Government announced that it had completed a new military base on the archipelago Franz Josef Land and the restoration of several, previously abandoned bases in the Arctic.[414] Four other Arctic military bases—at Rogachevo, Cape Schmidt, Wrangel Island, and the Sredny Peninsula—as well as a military airstrip called Nagurskoye, are, among other military facilities, also under construction. This massive build-up is thought to be intended to strengthen control of international shipping on the Northern Sea Route, protecting Russian oil and gas resources in the Arctic, but also as defense infrastructure in what has been described as a possible new cold war.

On the peninsula of Cape York in Greenland, the colonial outpost of the United States' Thule Air Force Base serves the US (and NATO) as a logistical hub and communications node for Arctic mobilization and surveillance. Established in 1951, Thule became a key station in the Distant Early Warning Line, the electromagnetic curtain extending across the Western ice cap designed to alert mainland USA of incoming USSR bombers carrying nuclear warheads. Today, Thule Air Base plays host to a variety of operations, including those concerned with ballistic missile early warning and defense, satellite control and tracking facilities (including one of the most powerful Raytheon's giant AN/FPS-120 Solid State Phased Array Radar), the air base, and the seaport which is only accessible for a short period during the summer.

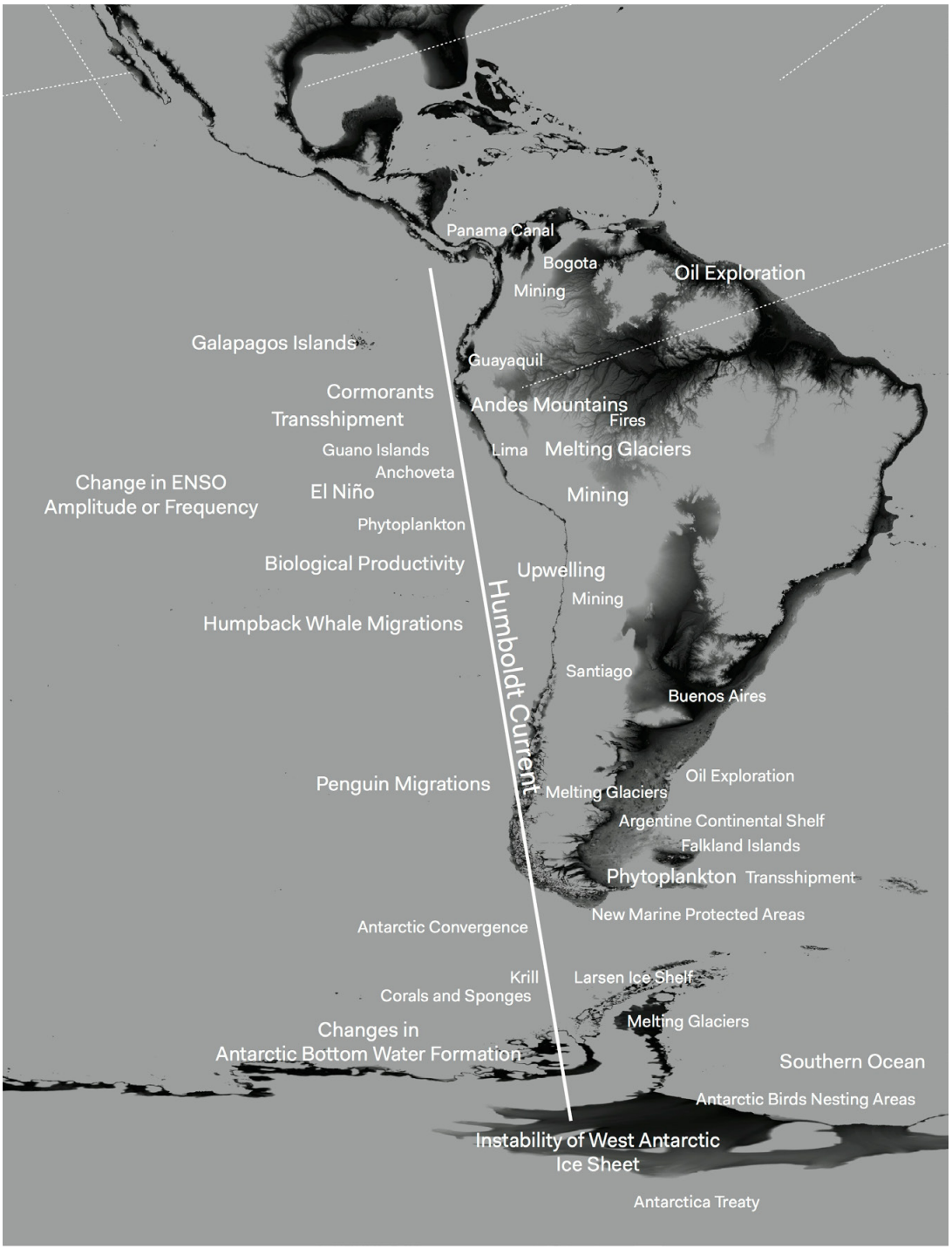
411. Chih Yuan Woon, "Framing the 'Polar Silk Road' (**冰上丝绸之路**): Critical Geopolitics, Chinese Scholars and the (Re)Positionings of China's Arctic Interests," *Political Geography* vol. 78 (April 2020): 102–141, https://doi.org/10.1016/j.polgeo.2019.102141.

412. The People's Republic of China State Council, "China's Arctic Policy," 2018, http://english.www.gov.cn/archive/white_paper/2018/01/26/content_281476026660336.htm.

413. See Ling Guo and Steven Lloyd Wilson, "China, Russia, and Arctic Geopolitics," *The Diplomat* (March 2020), https://thediplomat.com/2020/03/china-russia-and-arctic-geopolitics/

414. See "Russia's new Arctic Trefoil military base unveiled with virtual tour" on the BBC website (April 18, 2017), https://www.bbc.com/news/world-europe-39629819.

# 7. HUMBOLDT CURRENT




**Geographical Areas covered**

**California; Galapagos Islands; Colombia; Ecuador; Peru; Andes; Chile; Easter Island; Cape Horn; Drake Passage; Antarctic Peninsula; Larsen Ice Shelf; Filchner-Ronne Ice Shelf; Amundsen Sea; Ross Ice Shelf.**

Along the east coast of South America, a vast system of ocean circulation is one of the largest vital hotspots on the planet. Linking the cold waters of the Southern Ocean to the warm currents of the equatorial Pacific, the Humboldt Current sustains and drives the vast ecosystems of the region. It connects the deep sea with the high mountains of the Andes in a vast trophic chain.

From the Galapagos archipelago to Western Antarctica, we follow one of the richest life-producing environments on the planet, identifying new forms of marine protected areas, connections between the changes of the El Niño oscillations and amplitude of marine life, and the complex interconnections between these environments and the extensive mining activity in the Andes.

This trajectory indicates how a higher level of information and open data can increase transparency and accountability in the extraction industries. The links between the depletion of Antarctic ice and the economies of the Pacific are highlighted by combining global circulation models with data from satellite fishing monitoring.

Text by Territorial Agency

**Earth Beings and the Law of Mother Earth**

In settings as diverse as the Peruvian Andes, the Nepal Himalaya, the Alps, Mount Kilimanjaro, and the Hengduan Mountains in southwest China, local populations view glacier retreat as the result of their failure to show respect to sacred beings or to follow proper conduct. Deeply concerned that they have disturbed cosmic order, they seek to behave in closer accord with established traditions. As they anticipate that the retreat will continue, leading to further environmental degradation and to the decline of natural and social orders, they are experiencing strong distress. Since the middle of the twentieth century, the shrinking cryosphere in the Arctic and high mountain areas, for instance, have led to negative impacts on food security, water resources, water quality, livelihoods, the health and well-being, infrastructure, as well as culture of human societies, particularly for Indigenous peoples. While costs and benefits have been unequally distributed across populations and regions, adaptation efforts have benefited from the inclusion of Indigenous knowledge and local knowledge.[415]

In Indigenous Andean worlds, mountains are numinous agents that are crucial members of society.[416] The agentive capacities of mountains are not issues of belief but rather of how the world *is*. Agentive mountains, Earth Beings or *tirakuna*,[417] neither belong to the "supernatural"—as people interact with them even in the most "mundane" contexts—nor can they be reduced to "nature." These Indigenous worlds are thoroughly co-present and deeply involved in uneasy relations with the worlds founded on the *work of purification*, with coca, tobacco, or other sacred plants that allow to bridge the continuous but futile separation between predictable and objectified nature on the one hand and agentive human beings on the other.[418] It is "[n]ot a belief but a presence enacted through everyday practices through which runakuna [Andean humans] and earth-beings are together."[419]

The quest for the recognition of multi-perspectival worldviews (the most common translation for *cosmovisión*) spearheaded by Indigenous movements in the Andean region for decades (indeed centuries) has led to a long, uphill struggle. During the twentieth century, Indigenous communities have conversed with the colonial and neoliberal state in pursuing several important political projects: in their struggle for the recognition of Andean collective land, the granting of voting rights (to "illiterate citizens" as late as the 1970s[420]) and the acknowledgement of "ethnic rights" with respect to their culture and their difference (within the limits of what the state could recognize as culture and as different).

Until recently, post-colonial states systematically ignored Indigenous worlds and their reliance on all-important earth-beings. All the more important was their belated recognition in Bolivia, Ecuador, and Peru (if

415. IPCC Special Report on the Ocean and Cryosphere in a Changing Climate, 2019.

416. Guillermo Salas Carreño, "Mining and the living materiality of mountains in Andean societies," *Journal of Material Culture* vol. 22, no. 2 (December 2016).

417. Among the *Tirakuna*, a composite noun made of *tierra* and pluralized with the Quechua suffix *kuna*, *apu* (mountains) can be the most powerful beings in the Andes. Marisol de la Cadena, *Earth Beings: Ecologies of Practice across Andean Worlds* (Durham: Duke University Press, 2015), xxiii.

418. Bruno Latour, *We Have Never Been Modern* (Cambridge, MA: Harvard University Press, 1993).

419. De la Cadena, *Earth Beings*, 26.

420. Ibid., 264.

perhaps not as persistently in the latter), under the provisional term New Latin American Constitutionalism. Unexpectedly in the history of Andean nation-states and under pressure from Indigenous social movements and their allies, in 2008, a new constitution in Ecuador included the "rights of nature" or "Pachamama" and in 2010 Bolivia decreed the "Law of Mother Earth." These constitutional and legislative reforms established new pluricultural and multiethnic realities.

Both cosmovision and the traditional legal system it sustains, however, should not be regarded as purely "traditional," but rather—even if marked by continuity—as "contemporary phenomena which have changed in the course of a—usually conflictual—confrontation with the dominant system."[421] Ecuador's constitution, which is most frequently cited in this context, recognizes Indigenous notions of nature as a legal subject. It is based on the Spanish term *Buen Vivir* or *Sumak Kawsay* in Quechua, which means "good life." This juridical approach is in line with the global rights of nature movement, which aims, with some success, to grant undivided legal rights to natural entities (such as forests, rivers) and to Mother Nature.

The plurinational constitutions of Ecuador and Bolivia should be regarded as promising alternatives to the model of the Westphalian sovereign nation state and as inspiration for a new legal order which not only accords rights to communities living in what has been called partial connections with an agential world surrounding them, but sets in place ancestral systems of protection, care, and conservation. At the same time, according to geographer Astrid Ulloa, there is growing recognition of Indigenous peoples as "ecological natives," resurrecting time-tested ways of cohabitation with the earth, and this new designation coincides with an internationalization of environmental laws and multicultural rights that are at best harmonized with the legal conditions and economic practices of the environmental marketplace. This form of "eco-governmentality" converges "environmental policies, discourses, representations, knowledges and practices (local, national and transnational) that interact with the purpose of directing social actors (green bodies) to think and behave in particular manners towards specific environmental ends (sustainable development, access to genetic resources, conservation strategies and environmental security, among others)."[422]

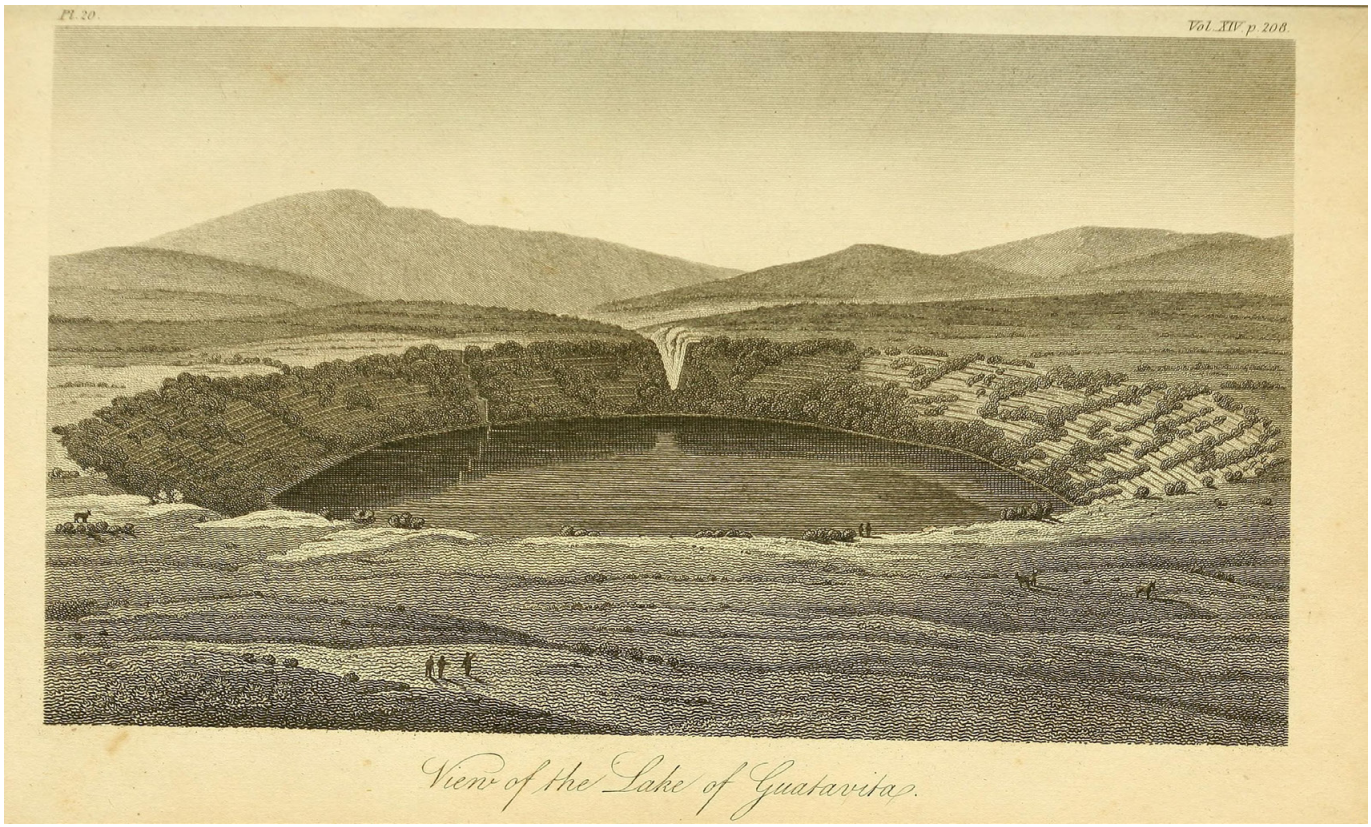
Outside of the domain of law as well, the reevaluation of Indigenous worldviews has stirred up a new understanding of complex more-than-human perspectives and offers alternative definitions of the "human" by inventing new interdisciplinary areas especially in the humanities, the social sciences, and anthropology. In critiquing and revising modernist knowledge practices that blocked them from noting the specificity, diversity, and heterogeneity of human worlds and cultures, Western thinkers have still, according to Métis theorist Zoe Todd, failed to acknowledge and name Indigenous thinkers whose achievements have inspired white academics to reformulate posthumanist ontologies, and whose achievements have faded into their shadow. She points out that indigenous ontologies can not only serve as "philosophical anecdotes" for a "new" Western concept of nature. Indige-

421. René Kuppe "Die Neue Verfassung Boliviens - Ausdruck Des Neuen Lateinamerikanischen Konstitutionalismus," *Juridikum*, no. 4 (October 1, 2009): 194. (Translation by the authors)

422. Astrid Ulloa, *The Ecological Native: Indigenous Peoples' Movements and Eco-Governmentality in Colombia* (London and New York: Routledge, 2011), 6.

nous worldviews have for centuries been regarded as "legal orders through which Indigenous peoples throughout the world are fighting for self-determination, sovereignty."[423] Todd stands here along with many Indigenous thinkers and activists in their shared struggle against the "ontological turn," a turn that originates in the Anglo-European criticism of modernism and takes a neo-imperial position, sometimes ignoring the important lessons of decolonialism. While the latter seeks to uncover the dark sides of colonial histories, ontological thinking would reproduce hegemonic conditions. Or, according to Todd: "'ontology' is just another word for colonialism."

Text by Daniela Zyman




↑ Image from 'Researches concerning the institutions & monuments of the ancient inhabitants of America.' London: Published by Longman, Hurst, Rees, Orme & Brown, J. Murray & H. Colburn,1814. Under CC license.

423. Zoe Todd, 'An Indigenous Feminist's take on the Ontological Turn: "ontology" is just another word for colonialism (Urbane Adventurer: Amiskwaciy)', *Uma (in)certa antropologia* (blog), 26 October 2014, https://umaincertaantropologia.org/2014/10/26/an-indigenous-feminists-take-on-the-ontological-turn-ontology-is-just-another-word-for-colonialism-urbane-adventurer-a-miskwaci/.

**The Humboldt Current**

The Humboldt Current, also known as the Peru-Chile Current, is a highly productive marine ecosystem that supports one of the largest fisheries of the world oceans. It is a cold and deep current characterized by the flow of fresh Sub-Antarctic surface water toward the southern tip of Chile and northward to Peru along the eastern rim of the subtropical gyre.[424] The collision of cold Sub-Antarctic waters with warm equatorial waters causes upwelling and brings a steady supply of sulfates and phosphates from the depths to the surface. The abundance of these nutrients brought up to the surface supports a wide range of small ocean organisms, which flourish and reproduce in great numbers. These organisms include diatoms, phytoplankton, and zooplankton, collectively forming the foundation of the marine food chain. One of the earth's most important upwelling ecosystems, the Humboldt Current produces about 20 percent of the world fish catch.

The current is named after the Prussian naturalist and geologist Alexander von Humboldt (1769–1859) who studied the cold current and recorded his measurements in his influential book *Cosmos*: *A Sketch of a Physical Description of the Universe* (1846). Humboldt conducted his scientific exploration as part of an expedition to South America sponsored by the Spanish Prime Minister Mariano Luis de Urquijo, who was interested in developing expert knowledge on the ecologies of Spain's colonies. Although some critical observations of the structures of colonial societies can be found in Humboldt's accounts, he nevertheless described local communities as feeble and degenerate and offered "a differentiated assessment of colonial societies based on comparisons of regional and local traditions and developments."[425] Humboldt's idealization of the autochthonous environment as virgin land, terra nullius, reveals the colonial impetus behind his explorations and classifications.[426] It goes without saying that although the "Humboldt Current" is predominantly known as such in scientific discourse, Native South Americans living on the coast of the eastern South Pacific had their own knowledge about the cold current and its resources, making use of coastal near-shore species, salt, guano, and whales, long before Humboldt's arrival in South America.[427]

424. Vivian Montecino and Carina Lange, "The Humboldt Current System: Ecosystem components and processes, fisheries, and sediment studies," in *Progress In Oceanography*, (December 2009), 65-79.

425. Sandra Rebok, "Alexander von Humboldt's perceptions of colonial Spanish America," *Dynamis* vol. 29 (2009).

426. Rex Clark and Oliver Lubrich, eds., *Cosmos and Colonialism: Alexander Von Humboldt in Cultural Criticism* (New York and Oxford: Bergham Books, 2012).

427. Tarsicio Antezana and Nibaldo Bahamonde, "History of Marine Science in Chile" *Oceanographic History: The Pacific and Beyond*, Keith R. Benson and Philip F. Rehbock, eds. (Seattle: University of Washington Press, ), 155–166.

→ Eduard Ender, 'Humboldt and Bonpland by the Orinoco River,' oil on canvas, 1768-1859. Under CC BY-NC 2.0 license.

A significant part of the population and economy of Chile and Peru depend on the riches of this vibrant ecosystem. Its fish productivity is likely to be affected by climate change, particularly increasing El Niño events, warming oceans, and overfishing. The Food and Agricultural Organization foresees a decline in the zooplankton-rich area of about 33 percent in the northern and central Humboldt Current System and a decline of 14 percent in the southern Humboldt Current System.[428] The weakening of the upwelling is projected to be affected by stratification, when different water masses overlap and act as barriers to water and nutrient mixing. The primary commercial catch in the current is a single anchovy species stock, *anchoveta*, which is a main prey of marine mammals, seabirds, and fish; the disproportionate fishing of the singled-out animal causes trophic cascade in the complex ecosystem. Along with overfishing, other localized anthropogenic stressors along the coastal fringe that generate pollution and habitat degradation problems, which also directly impacts the system's productivity. Petroleum spills, emissions of organic and inorganic residuals of domestic and industrial processes, habitat degradation through aquiculture activities, and the physical alteration of the coastal border by developers are increasingly threatening fragile coastal habitats that can be important nursery areas of both benthic and pelagic marine species.[429]

Text by Pietro Scammacca

428. FAO, "FAO Warns of Climate Change Impact on World's Most Productive Marine Ecosystem: the Humboldt Current System," www.fao.org/americas/noticias/ver/en/c/1144974/#:~:text.

429. Jose Luis Blanco et. al, "Integrated overview of the oceanography and environmental variability of the Humboldt current system," Proyecto Regional (2002).

→ Friedrich Georg Weitsch, 'Alexander von Humboldt and Aimé Bonpland at the foot of the Chimborazo volcano,' oil on canvas, 1806. Public domain.

**Fossil Fuel and the Oceans in California**

The trajectory sets off in the coastal waters of California, in the nutrient-rich California Current which has been massively affected by mineral extraction and port developments. Since the 1980s, California has been the third largest producer of crude oil in the United States (in par with Alaska), in defiance of its reputation as ground zero for the nation's environmental movement. Among the leading developers are Chevron Corporation and Occidental Petroleum, as well as Plains Exploration, Linn Energy, and Breitburn Energy Partners. Altogether, at least thirty-two drilling sites exist both on land and offshore in California, along with offshore production from the Outer Continental Shelf that is regulated by the federal government.

The issue of state versus federal ownership has a long and contentious history in California. Offshore drilling has not been on the state's political agenda for a long time. In 2018, the Trump administration issued an executive order reversing a decision by Obama's administration to block drilling on about 94 percent of the US outer continental shelf. Seven areas offered for new drilling as part of this order are in Pacific waters off the coast of California, where drilling has been off limits since a 1969 oil spill near Santa Barbara.

→ Oil Platform off the California Coast. Photo: Damian Gadal. Under CC BY-SA 2.0 license.

Furthermore, in October 2019, the Trump administration decided to override the state of California, granting access to 725,500 acres for oil and gas exploration from central to northern California and effectively ending a six-year moratorium.[430] No federal lease sales have occurred in California since 2013, when a court ruled that the Bureau of Land Management (BLM) failed to consider the risks of fracking when it issued oil leases in Monterey and Fresno.[431]

There are four offshore oil platforms in state waters off the coast of California: Holly in Santa Barbara County, Eva and Emmy in Huntington Beach, and Esther off Seal Beach. There are also four large artificial islands in the Long Beach Harbor, known as the Long Beach Unit, and one small artificial island, Rincon Island, located off Rincon Beach in Ventura County. In addition, twenty-three oil and gas production facilities have been installed in federal waters. Twenty-two of these facilities produce oil and gas, while the other is a processing facility.[432] These facilities have effectively reshaped the coastal zones of the state, with long-term implications of increased activities in those areas, which include marshes, estuaries, and tidal flats all of which are crucial to sustaining marine life, directly or indirectly.

In addition to oil extraction, California is home to the two largest ports in the US. These superports are located in Los Angeles and Long Beach along both sides of the San Pedro Bay, some 20 miles south of downtown Los Angeles. Both have deep shipping channels that allow them to handle the increasingly large ships that cross the Pacific Ocean. The two ports have some of the most extensive dockside rail operations in the country and they share a manmade island full of cargo terminals and a dedicated railroad corridor. Both ports handle many kinds of cargo that is not shipped in con-

430. https://www.forbes.com/sites/kensilverstein/2019/10/06/will-californias-brand-as-the-denizen-of-green-energy-be-tarnished-by-allowing-new-drilling-in-its-coastal-areas/#1e1f7f2a6224

431. https://thehill.com/policy/energy-environment/464429-trump-administration-announces-end-of-five-year-oil-and-gas

432. https://www.slc.ca.gov/oil-gas/

tainers, like oil, coal, concrete, and cars. Cargo that isn't destined for West Coast markets is put on freight trains that haul it across the United States, giving the Southern California ports an outsized role in the nation's economy, especially for trade with Japan, Taiwan, and other Asian markets.

As the Trump administration has put offshore drilling back on the table, ecological concerns and cumulative anthropogenic impacts are being hotly debated again. The nutrient-rich waters of the California Current, which flows along the length of the coast, sustains intricate food webs, including great white sharks, elephant seals, and kelp forests and gives rise to valuable and unique ecosystems. These are already under considerable pressure from fishing, coastal developments, oil transportation by tankers, superports, and fracking. Storm surges, kind tides, and sea level rise are expected to exacerbate the ecological consequences arising from fossil fuel infrastructure. A global map of the cumulative impact of human activities on marine ecosystems shows that the California Current region has many areas of high impact and very few refuges of low impact. A comprehensive study has confirmed that the highest impacts are concentrated around areas of large human populations, such as Puget Sound, as well as locations in Central and Southern California, and areas of heavily polluted watersheds such as Tijuana and southern Oregon. Intertidal and nearshore ecosystems are most heavily impacted because of exposure to stressors from both land- and ocean-based human activities.[433]

Text by Daniela Zyman

**Mining Activity in the Andes**

"[What we need to do is to] defeat those absurd and pantheistic ideologies who believe the mountains are gods and the wind is god. [These beliefs] mean a return to those primitive forms of religiosity that say 'do not touch that mountain because it is an Apu, because it is replete with millenarian spirit' ... and what have you. ... Well, if that is where we are, then let's do nothing. Not even mining ... we return to primitive forms of animism. [To defeat that] we need more education." —Alan García, President of Peru, 2006–11[434]

At a time when new eco-centric jurisdictions were hailed as environmental breakthroughs, the Andean states continued their claims to native lands, occupying and exploiting them for mining and oil extraction. The unwillingness of many politicians to accept the terms of Pachamama exposes the limits of recognition that the modern state accords to its "Other" subjects. When in August 2013, Ecuadorian President Rafael Correa announced his government's abandonment of the 2007 Yasuní-ITT treaty, the innovative attempt to reverse the economic arrangement of oil extraction in the Amazon by keeping the oil in the ground in exchange for international assistance, many hopes were shattered.

433. Benjamin S. Halpern et al., "Mapping Cumulative Human Impacts to California Current Marine Ecosystems," *Conservation Letters* vol. 2, no. 3 (June 2009): 138–48, https://doi.org/10.1111/j.1755-263X.2009.00058.x.

434. Cited in De la Cadena, *Earth Beings*, 169.


→ Cerro de Pasco Mine, Peru - Panoramic View of Pit Looking Northeast. SkyTruth. Under CC BY-NC-SA 2.0 license.

Over the years, Big Oil companies, including Texaco, Occidental Petroleum, Brazil's Petrobras, Venezuela's PDVSA, and others backed by the Chinese CNPC and Sinopec, as well as the Ecuadorian state firms PetroEcuador and PetroAmazonas, have all played a role in the extraction sector in Peru. Many of these companies have been involved in irresponsible drilling that has led to considerable pollution, oil spills, and the displacement of Indigenous communities. The most famous example is Texaco's exploration and extraction in the northeastern corner of the country near the towns of Lago Agrio and Coca. This involved the construction of a faulty pipeline, dumping 68 billion liters of produced water—a toxic byproduct of the extraction of oil and natural gas—into waterways and creating a major disaster zone with unlined pits that frequently spill over when it rains. A fierce legal battle against Chevron, who later acquired Texaco, has raged over this issue in several courts (including the Permanent Court of Arbitration in The Hague which has ruled in favor of the oil company in 2018).[435]

Another, although very different case of denial and abandonment of Indigenous people, is the Mapuche movement in Chile. The Mapuche resistance dates back to 1979, when General Pinochet imposed Law No. 2568, which stripped Indigenous lands of their designation and de-classified their owners as Indigenous people. In the late 1990s, the then acting government approved a plan by Spanish consortium Endesa to raze forests and uproot entire ecosystems to build the Ralco Hydroelectric Power Plant, which opened in 2004 in the heart of Mapuche territory. In response, many Mapuche groups forged strategic alliances with national human rights and environmental movements like the Bío Bío Action Group. The agenda of the Mapuche movement has since transformed to insist on their historical claim to the ancestral territory that they call Wallmapu. This territory extends from the Limarí River north of Santiago, to the Chiloé Archipelago on the Pacific coast, to the southwest tip of Chile on the Atlantic, including Patagonia. According to anthropologist Guillaume Boccara, "indigenous associations no longer defined Mapuche people as poor peasants lacking land, but as a people whose territorial sovereignty had been alienated and whose socioterritorial organization had been superseded by Chilean administrative divisions."[436]

435. See "Texaco/Chevron lawsuits (re Ecuador)," Business and Human Rights Resource Centre, https://www.business-humanrights.org/en/texacochevron-lawsuits-re-ecuador

436. Guillaume Boccara, "The Mapuche People in Post-Dictatorship Chile," Études Rurales, no. 163–164 (January 2002): 283–303, https://doi.org/10.4000/etudesrurales.7984.

In the legal war against the Mapuches, the state criminalized their activities, reconstituting Indigenous land and water defense as acts of national terrorism. In 1998, the Chilean government passed the Anti-Terrorist Law, which worked to suture the negative historical image of Mapuches in ways that have had devastating effects for those defending communal lands. In the popular protest that broke out in Santiago in November 2019, protesters were waving the Mapuche flag above a colonial statue in one of the city's central squares in a sign of solidarity with Indigenous people's defiance against neocolonial corporate plunderers.

Indigenous land defense needs to be read against the fact that the mining industry is one of the most powerful economic engines in South America. The continent contains about a fifth of the world's iron ore reserves and more than a quarter of the world's known copper reserves are in South America, mostly in Peru and Chile. The Chuquicamata mine in northern Chile is considered the world's largest open-pit copper mine. It is 4.3 kilometers long, 3 kilometers wide and more than 847 meters deep. The mine's smelter (which extracts the copper from rock ore) and refinery (which purifies the extracted copper) are also among the largest in the world. Other important metal deposits along this trajectory include tin, lead, zinc, and low-grade gold.

Chile also has one of the world's largest reserves of fresh water outside the north and south poles. Glaciers and rock glaciers in the semiarid Andes constitute natural stores of water that control the runoff of mountain rivers, especially in the dry summer months. In the Andes, glacier retreat and related processes of change in the cryosphere have afforded greater accessibility for extractive industries and related activities to mine minerals and metals. Accelerated glacier shrinkage and retreat have been reported to facilitate mining activities in Chile, Argentina, and Peru.[437]

These mining activities affect glaciers and the environment around them due mainly to excavation, extraction, use of explosives, and the deposition of dust and other mine waste in proximity to or on top of glaciers. These activities generate slope instabilities and glacier mass loss due to surface melt. The vast rock glacier areas in the Upper Blanco catchment have been affected by mining activities since the Sur Sur pit operated by División Andina opened in 1980. As of 2008, it has led to the almost complete disappearance of two rock glaciers.[438] According to the IPCC report on the Ocean and the Cryosphere, projected glacier mass reductions between 2015 and 2100 correspond to a sea-level rise contribution of 94 ± 25 millimeters. The tropical Andes are projected to lose more than 80 percent of their ice mass by 2100.[439]

The deposition of mine waste on glaciers such as the Infiermillo rock glacier, which began as far back as 1990, has had aggravating long-term impact. The geochemical weathering of the waste rock is likely to produce acid rock drainage that may affect water discharge from the rock glacier.

437. Alexander Brenning, "The impact of Mining on Rock Glaciers and Glaciers: examples from central Chile," *Darkening Peaks: Glacier Retreat, Science, and Society*, ed. Ben Orlove, Ellen Wiegandt, and Brian Luckman (Berkeley: University of California Press, 2008).

438. IPCC report: "The Ocean and Cryosphere in a Changing Climate" (2019), https://report.ipcc.ch/srocc/pdf/SROCC_FinalDraft_FullReport.pdf.

439. Ibid.

Underground mining not only mutilates the body of the mountains but ultimately threatens their fertility and, hence, their capacity to provide food and sustain life.

Glacier protection laws and similar measures have been introduced in countries such as Chile and Argentina to address these issues. In addition, the United Nations Human Rights Council passed a declaration in 2018 to "protect and restore water-related ecosystems" from contamination by mining, however, evidence on the effectiveness of these measures remains inconclusive.

The depletion of mineral resources in the Andes is shown on the trajectory via data taken from the Mineral Resources Data System, a collection of reports describing metallic and nonmetallic mineral resources throughout the world.

Text by Daniela Zyman and Pietro Scammacca

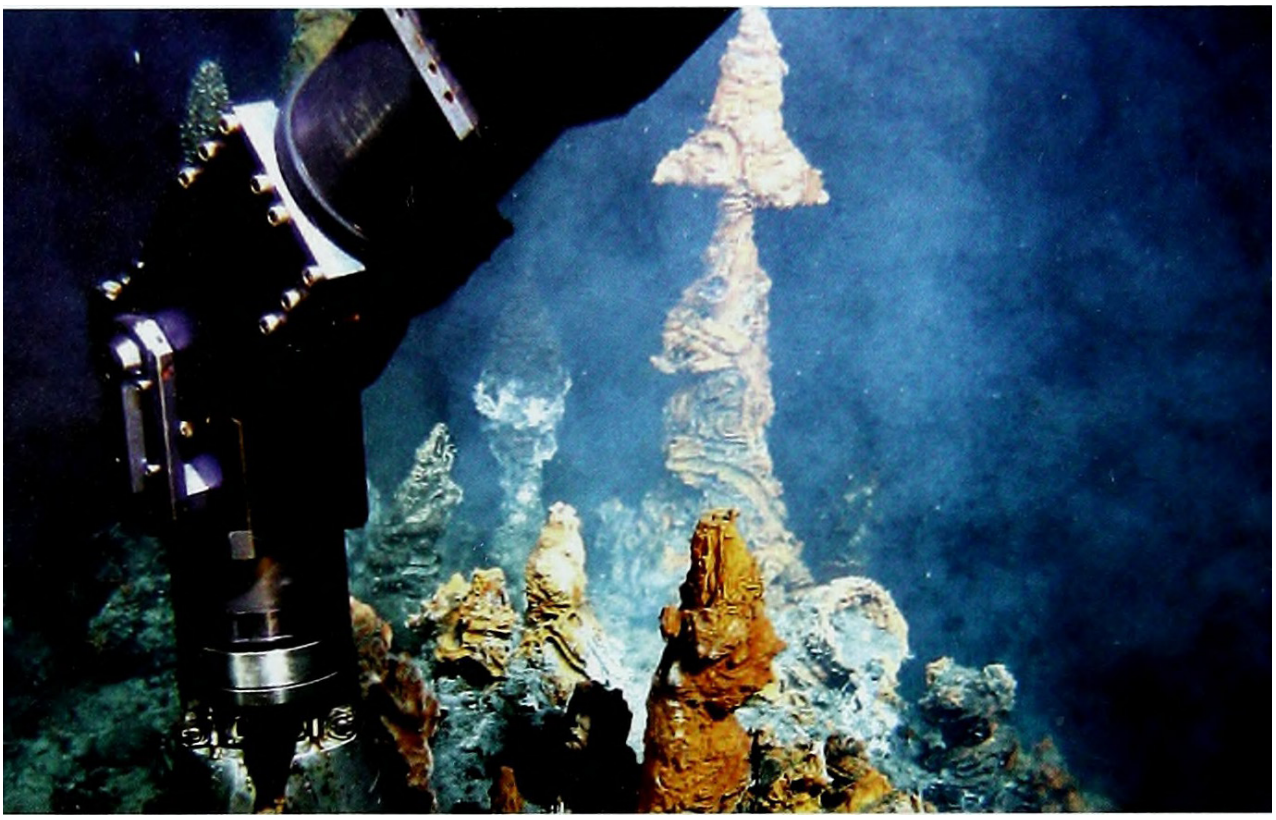
**Greenwashing the Mining Industry**

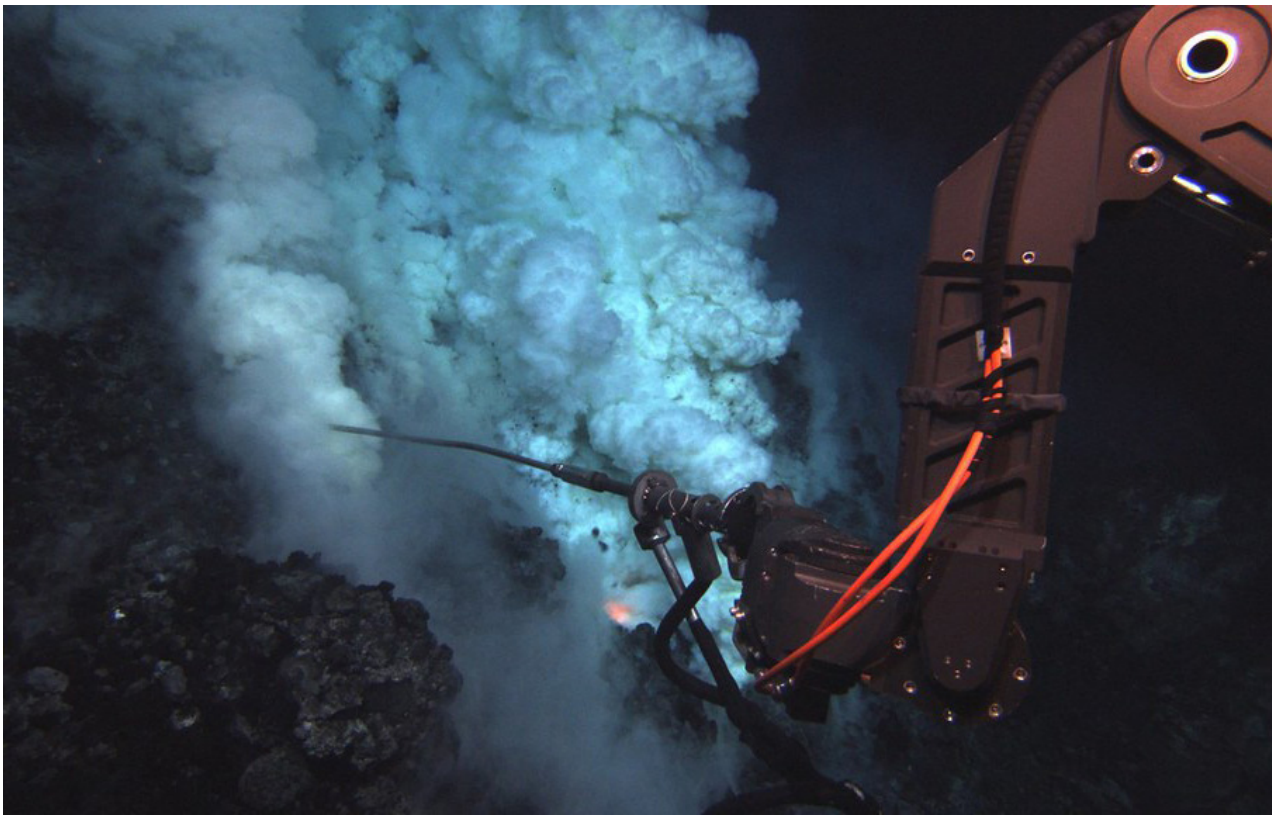
Traversing the Andes and the Peru Basin, this trajectory considers mining activities occurring both on and off land. In the deep sea, the extraction of manganese nodules removes vital habitats for autochthonous organisms, making recovery for those animals virtually impossible given the long time nodules require to form. This was first proven in the Peru Basin, where the first long-term disturbance and recolonization experiment (DISCOL) took place in 1989 at a depth of more than 4,000 meters. Replicating the disturbance caused by commercial mining operations, the experiment aimed to monitor the recolonization of the biota on the ploughed habitat across several time intervals. After returning to the Peru Basin in 2015, results showed that the tracks made by the plow were still visible while the biomass and biodiversity of the animal communities did not recover. Despite the known irrecoverable damages of deep-sea mining, in summer 2020 a new mining code that regulates seabed mining in international waters is expected to be adopted by the 167 member countries of the International Seabed Authority. This legal code will contain a comprehensive set of rules, regulations, and procedures controlling the exploration and exploitation of marine minerals, deemed to be the common heritage of mankind.

The converging political and economic interests that steer such intergovernmental policies suggest that deep-sea mining is becoming a new frontier of capitalist extraction, a new, temporary form of sustenance for the insatiable mineral commodity market. As the global economy switches to low-carbon technologies, global demand for minerals could rise by as much as 900 percent by 2050.[440] The switch to green technology and the high demand for minerals associated with it, pose an opportunity to both land and offshore mining industries to advance a greenwashing strategy of extracting "minerals for climate action."[441] This paradoxical idealism is the product of a presumed ontological opposition of *bios* and *geos* that ignores the symbiotic relation of the geologic formations and the biological life that

440. "Climate-Smart Mining: Minerals for Climate Action," The World Bank, https://www.worldbank.org/en/news/infographic/2019/02/26/climate-smart-mining.

441. Ibid.





↑ ↑ Image from 'Deep-sea biodiversity and ecosystems - a scoping report on their socio-economy, management and governance.'
Internet Archive Book Images. Public domain.

↑ The Jason ROV sampling hydrothermal fluid in the Northeast Lau Basin, Fiji area of the Pacific Ocean. Photo: NOAA photo library. Under CC BY 2.0 license.

is intrinsic to these idiosyncratic sites. The fallacious distinction between *bios* and *geos*, which is rooted in Western science, falls under what theorist Elizabeth Povinelli has called "geontopower"—the governance of the distinction between life and nonlife itself. Povinelli defines geontopower as that which, unlike biopower, "does not operate through the governance of life and the tactics of death but is rather a set of discourses, affects, and tactics used in late liberalism to maintain or shape the coming relationship of the distinction between Life and Nonlife."[442] Geontopower provides a theoretical framework to understand the ontologies of settler liberalism that recognize mountains and deep-sea abyssal plains as seemingly barren sites devoid of life, where mineral extraction for the greater good is presented as inconsequential.

Text by Pietro Scammacca

**Toward Pluriversal Marine Protected Areas**

Marine Protected Areas (MPAs) are established to restrict or ban human activity in the seas, oceans, and estuaries for conservation and research purposes. They are implemented in various forms and restrictions, and managed on different scales, whether territorial, regional, national, or international. At the moment, only 7 percent of the oceans are formally protected, against the 10 percent goal set by the UN in 2010. When financed, administered, and properly enforced, MPAs provide an effective conservation strategy for biodiversity and habitat protection. However, these zones may also become "paper parks," meaning they only exist on the map and for legislative purposes, with little effect on the marine ecologies they claim to protect. In efforts to overcome such ineffectiveness, activists, communities, and non-governmental organizations around the world are working toward the enforcement and enlargements of MPAs.


→ El Nino. Unknown author. Public domain.

442. Elizabeth Povinelli, *Geontologies: A Requiem to Late Liberalism* (Durham: Duke University Press, 2016).

In recent years, South American territorial waters have seen a remarkable growth in marine protection and conservation. MPAs have been proliferating in particular in Chile, Argentine, and Uruguay, with millions of square kilometers of ocean now protected. Chile, one of the world leaders in MPAs, counts twenty-five marine protection sites that in total cover almost half of the country's territorial waters. Since the United Nations' 2010 "year of biodiversity," the country has moved from having 463,000 square kilometers of protected marine territory to more than 1.3 million. While various types of MPAs have been implemented, most areas in Chile ban all human activities except scientific research. Former Chilean President Michelle Bachelet has been pivotal in this rapid change of biodiversity management. In 2017, she committed to create a MPA in Admiralty Sound in Tierra del Fuego, an eighty kilometers long fjord adjacent to Karukinka Natural Park. The newly declared protected area now hosts leopard seals, elephant seals, black-browed albatrosses, Magellanic penguins, and other wildlife.

Most of Chile's MPAs are, however, offshore, with only 1 to 2 percent located near the coast.[443] Implemented in sites characterized as "remote" and "pristine," the very concept of MPAs is often symptomatic of an ontological divide between "nature" and "culture" and bases quality standards on a fallacious "immaculate" baseline. More specifically, MPAs are indicative of a political position that perceives biodiversity as a spatial problem, one to be tackled with paradigms of territorialism and bordering. In Chile, the administration of biodiversity conservation is complex, but all MPAs are managed by the environment ministry and protected by the navy—territorialized and militarized conservation repeats an imperialistic idea of a pristine nature reminiscent of colonial patterns of power and knowledge.[444] In political discourse, MPAs may also be instrumentalized by positivist, neoliberal narratives of success that dangerously assume that such ecosystems havens suffice to repair capitalist-driven ecological damage: in 2018, Bachelet declared that "the greatest achievement for Chile is that the environment is no longer an issue for environmentalists or idealists."[445]

Bachelet, however, was the president to designate the Rapa Nui Large-Scale MPA around Easter Island, which today is one of the few MPAs in the world in which Indigenous people voted to establish the boundaries and level of protection. This inclusive decision shows an effort to decolonize frameworks of relating to more-than-human nature, which are pertinent to the so-called New Latin American constitutionalism, a term which has been used to describe the legal orders through which certain South American states have granted legal rights to natural entities and recognized the collective rights of Indigenous communities. The degree of coherence through which state-controlled conservationism is based on Indigenous ontologies of marine territory remains subject to debate.[446] That being said, the Rapa

443. Fermín Koop, "How Latin America Is Leading the Way for Marine Protection," *Chinadialogue Ocean* (April 5, 2019), chinadialogueocean.net/7428-latin-america-leading-marine-protection/.

444. Ibid.

445. "Admiralty Sound (Seno Almirantazgo) Becomes First Marine Protected Area in Chile's Tierra del Fuego," Wildlife Conservation Society, newsroom.wcs.org/News-Releases/articleType/ArticleView/articleId/11155/Admiralty-Sound-Seno-Almirantazgo-Becomes-First-Marine-Protected-Area-in-Chiles-Tierra-del-Fuego.aspx.

446. Saah Bess Jones Zigler, "MPA: Marine Protected Area or Marine Pluriversive Area? A Political Ontology of Large Scale Marine Conservation in Rapa Nui (Easter Island Chile)," dissertation, 2020, https://dukespace.lib.duke.edu/dspace/handle/10161/21047

Nui MPA may well represent an initial step in acting in "pluriversal ways," as opposed to universal ways, of relating to more-than-human nature and to make way for "abundant futures" that reckon with colonial-capitalist ruination.[447]

Text by Pietro Scammacca

**Changes in El Niño Southern Oscillation**

The El Niño-Southern Oscillation (ENSO) is a dominant mode of seasonal and yearly climate variability that affects much of the tropics and subtropics. The term describes the oscillation of two winds and sea surface temperatures, El Niño and La Niña, in the southern Pacific Ocean. El Niño is a warm ocean current that develops in the central and east-central equatorial and reaches the area off the Pacific coast of South America at the time of year when eastern trade winds weaken. It typically takes place around Christmas (which is what game the phenomenon its name: because of the time of year, local fishermen named the current "boy child" in reference to the Christ Child) and causes the dense, cold water to settle down in the deep ocean while warm water takes over the surface of the water. When the warm current moves toward South America, the convection process and the formation of rain clouds associated with it move along with it. This causes heavy rains and floods in the American continent, and draughts in the western Pacific Ocean, in particular the inland parts of Australia. La Niña is the reverse process of the oscillation. It is a cold ocean current that occurs when eastern trade winds are strong and push the warm currents toward the western Pacific Ocean, allowing the cold water to reach the surface of the eastern coasts of the Pacific Ocean (thermocline). As with El Niño, the convection process and rain clouds associated with La Niña travel with the current, bringing heavy rains and floods to Australia, New Zealand, and Indonesia and creating draughts in the South American continent.

El Niño events are likely to increase in frequency and intensity due to global heating. Studies suggest that increased frequency in El Niño arises from the warming of ocean surfaces, in particular in the eastern equatorial Pacific Ocean. Recent research has also found evidence that in the early Pliocene Epoch higher temperatures caused permanent El Niño condition in the region.[448] In the 1980s and 1990s, extreme El Niño events drastically reorganized atmospheric conditions, severely disrupting global weather patterns, affecting ecosystems, agriculture, tropical cyclones, drought, bushfires, floods, and other extreme weather events worldwide. Climate simulations have shown that anthropogenic climate change can produce systematic increases in the connections between different regions affected by ENSO, driving increased interannual variability in regional temperature extremes and wildfire frequency.[449] *More than a climate phenomenon to be understood in merely meteorological terms, the geographical reach*

447. Rosemary-Claire Collard, Jessica Dempsey, and Juanita Sundberg, "A Manifesto for Abundant Futures," *Annals of the Association of American Geographers* (December 2014).

448. Ana Christina Ravelo, Petra Simonne Dekens, and Matthew McCarthy, "Evidence for El Niño– like conditions during the Pliocene," *Science* vol. 309 (August 2005): 758–61.

449. J. T. Fasullo, B. L. Otto-Bliesner, and S. Stevenson, "ENSO's Changing Influence on Temperature, Precipitation, and Wildfire in a Warming Climate" Geo*physical Research Letters* (2018).

*of ENSO and its repercussions across politics, economics, culture, and infrastructure make it a major reorganizing principle of everyday life across the globe.*

To assess the extent and deadly impact of monsoon irregularities, historian Mike Davis in his book *Late Victorian Holocausts: El Niño Famines and the Making of the Third World* examines a series of monsoon failures and resulting El Niño–induced droughts and the famines that they spawned around the globe in the last third of the nineteenth century. Davis calculates that 30 to 60 million people perished during the three global subsistence crises of that time, triggered by natural incidents and aggravated by the imperial arrogance of rulers.[450] He writes: "The great famines are the missing pages. [...] At issue is not simply that tens of millions of poor rural people died appallingly, but that they died in a manner, and for reasons, that contradict much of the conventional understanding of the economic history of the nineteenth century. For example, how do we explain the fact that in the very half-century when peacetime famine permanently disappeared from Western Europe, it increased so devastatingly throughout much of the colonial world?"[451] The interlinking of monsoon fluctuations and the forcible integration of "tropical humanity" into the economic and political structures of the "modern world system," can be considered the prehistory of what journalist Christian Parenti has called the "tropic of chaos."

Text by Daniela Zyman and Pietro Scammacca

**Changes in Antarctic Bottom Water Formation**

The Antarctic Bottom Water, or Circumpolar Deep Water, is a type of water which is formed around the edge of the Antarctic continent, especially in the Ross and Weddell seas. The water is pushed across the southern ice sheet by extremely cold winds which add density to it before making the water spill over the edge of the ice shelves. Because of its cold temperature, ranging from -0.8 to 2°C and high salinity level, the Antarctic Bottom Water is the densest water mass of the oceans, which causes it to sink down toward the seabed when it spills over the ice shelf. As the water moves along the bottom of the oceans, the abyssal plain is almost exclusively composed of Antarctic Bottom Water. Because no oxidation from deteriorating organic content takes place in Antarctic Bottom Water, the water mass has a high oxygen content in comparison to the rest of the oceans' deep waters. For this reason, the sinking and recirculation of Antarctic Bottom Water is a vital ventilation process of the deep oceans, and a regulator of the storage of heat and carbon.[452] Its circulation across the seabed also upwells nutrients and carbon toward the surface, thus facilitating the food chain across the water column. The dense water's circulation along the seabed makes it one of the drivers of global thermohaline circulation, the great ocean conveyor belt that moves heat from the equator to the poles.

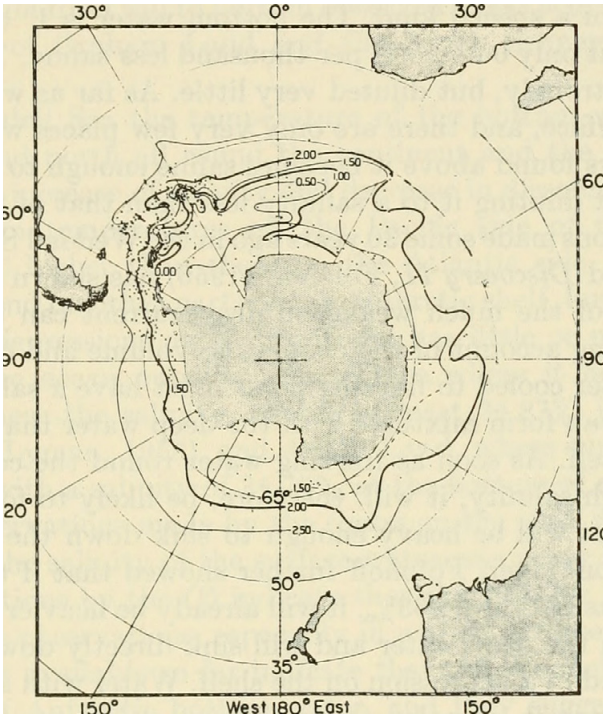
450. Mike Davis, *Late Victorian Holocausts: El Niño Famines and the Making of the Third World* (London and New York: Verso, 2017), 7.

451. Ibid., 8–9.

452. Véronique Lago and Matthew H. England, "Projected Slowdown of Antarctic Bottom Water Formation in Response to Amplified Meltwater Contributions," *The Journal of Climate* vol. 32 no. 19 (October 2019), https://doi.org/10.1175/JCLI-D-18-0622.1.

However, climate change and the melting of the southern ice sheet have slowed the formation of Antarctic Bottom Water, and this slowdown is likely to continue with a potential complete shutdown occurring as early as 2050.[453] Researchers from McGill University have analyzed the surface layer of water at the Weddell Sea, one of the principle sites for the formation of Antarctic Bottom Water, to find that it had been getting decreasingly salty since the 1950s.[454] As the research explains, "freshwater is less dense than saltwater, and it acts as a lid on the Weddell system, trapping the subsurface warm waters and preventing them from reaching the surface. That in turn, stops the mixing that produces Antarctic Bottom Water at that site."[455] The increase in freshwater is coming from two sources, the first of which is the amplification of the global water cycle by climate change, with increasing evaporation and precipitation; the second is the rapidity of the calving and melting of Antarctic glaciers. Both human-induced transformations end up pouring more freshwater to the Weddell Sea than what the area experienced in the past. Thus, enhanced land-ice melt not only alters the cycling of heat, carbon, and nutrients by the global ocean, but also drives a reduction in the recycling of nutrients from the seafloor into the upper ocean.

Text by Pietro Scammacca




→ Image from 'The Composition of sea-water: comparative and descriptive oceanography', 1963, Hill, Maurice Neville, 1919, p. 304. No known copyright restrictions.

**Instability of the West Antarctic Ice Sheet**

The West Antarctic Ice Sheet was first deemed unstable in 1968 by glaciologist John Mercer. The majority of the West Antarctica Ice Sheet is "grounded" in a bed that lies below sea level. The contact with water allows

453. Ibid.

454. Sarah Zielinski, "Climate Change Felt in Deep Waters of Antarctica," *Smithsonian.com*, Smithsonian Institution (March 3, 2014), www.smithsonianmag.com/science-nature/climate-change-felt-deep-waters-antarctica-180949939/.

455. Ibid.

ocean currents to deliver warm water to glacier grounding lines, the location where the ice attaches to the bed. According to NASA, scientists identify this as the first step in a potential chain reaction: "ocean heat eats away at the ice, the grounding line retreats inland and ice shelves lose mass. When ice shelves lose mass, they lose the ability to hold back inland glaciers from their march to the sea, meaning those glaciers can accelerate and thin as a result of the acceleration. This thinning is only conducive to more grounding line retreat, more acceleration and more thinning. In this equation, more ice flows to sea every year and sea level rises."[456]

Another factor causing instability is the downward inland slope of the West Antarctica Ice Sheet. In some spots, the bed lies more than a mile and a half below sea level. The shape of this slope means that when grounding lines start to retreat, ocean water can infiltrate the gap between the ice and the bed and cause the ice sheet to float off its grounding line. The downward, inland slope of the ice sheet was theorized at the end of the twentieth century, and has been confirmed and mapped in detail in recent years by airborne campaigns such as NASA's Operation IceBridge.[457]

Anthropogenic activity has transformed natural cycles surrounding the West Antarctic Ice Sheet, increasing the rate of ice melt. Winds around the region explain the transition between relatively warm and cool ocean conditions around certain glaciers. Although natural variations are to be expected, increased greenhouse gas has changed the nature of these winds, altering their trajectory and strength, resulting in warm ocean conditions becoming more prevalent.[458]

Historically, Antarctic Ice Sheet melt has been self-regulated via slow changes in the earth's crust. At its largest, during the Ice Age, the Antarctic Ice Sheet put pressure on the ocean floor, causing it to sit at least 1,300 feet lower than it does today. As the ice heated up, thinned, and broke off, this pressure was relieved, making the earth's crust rebound upward. This rebound sheltered the remaining ice from warm ocean currents, allowing the ice sheet to stabilize and regrow. Given the current rises in temperature and atmospheric carbon dioxide levels, such a bounceback cannot be extrapolated into our future. Studies have proven that uplift has bought us time however, but cannot remedy the impressions of anthropogenic activity, which will inevitably destabilize the ice sheet if no action is taken.

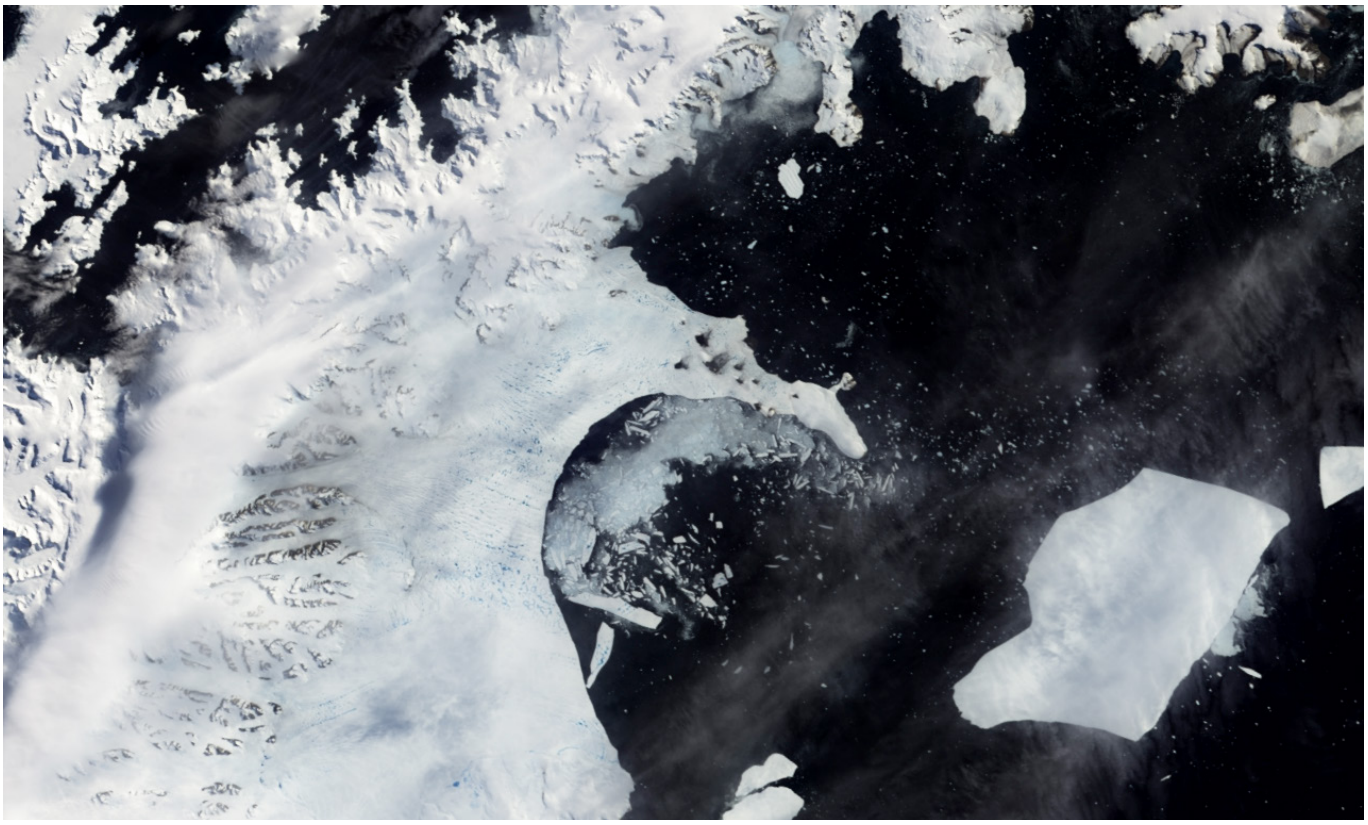
This trajectory uses images collected by NASA and the US Geological Survey's Landsat 7 Image Mosaic of Antarctica.

Text by Dolly Church

456. Alan Bui and Steve Cole "The 'Unstable' West Antarctic Ice Sheet: A Primer," NASA News (May 12, 2014), https://www.nasa.gov/jpl/news/antarctic-ice-sheet-20140512.

457. Ibid.

458. University of Washington Staff, "First evidence of human-caused climate change melting the West Antarctic Ice Sheet," UW News (August 12, 2019), https://www.washington.edu/news/2019/08/12/first-evidence-of-human-caused-climate-change-melting-the-west-antarctic-ice-sheet/.



↑ Researchers Provide Detailed Picture of Ice Loss Following Collapse of Antarctic Ice Shelves. Photo: NASA Goddard Space Flight Center. Image under CC BY 2.0 license.

**Transshipment off the South American EEZs**

Transshipment hotspots skirt the boundaries of the Peruvian and Argentinian EEZs. In fact, it is estimated that 8 percent of all likely transshipment events on the high seas occur immediately outside of Peru's EEZ. In both cases, the transshipment activity occurs within the high seas in the vicinity of productive squid fisheries: in the case of Peru, the squid vessels are regulated by the South Pacific Regional Fisheries Management Organization (SPRFMO), but no such organization exists to manage the high seas off the coast of Argentina, making the country vulnerable to exploitation from international squid jiggers.

The congregation of transshipment activity near the EEZ boundary raises two transparency concerns. The first is simply that this activity is occurring within a vast region that extends into neighboring national waters and international jurisdictions, making regulation a subject of geopolitical cooperation. Where national interests conflict and discrepancies in approach arise, attempts to clamp down on illegal fishing practices have generally failed. For instance, this has been exemplified by Argentina and the UK's ineffective monitoring of the Falklands/Malvinas islands, as well as around Uruguay, where Chinese investors have bought up ports, effectively earning them sovereign territory in the South Atlantic.

The second concern is the proximity of the transshipment activity to the EEZ boundary. This could enable a "dark fleet" of vessels that are not broadcasting AIS to fish without authorization within the EEZ and then transship that catch to vessels outside the EEZ, thereby avoiding the need to make port calls with illegally caught fish. Without sufficient tracking methods, authorities are forced to read between the lines to infer where intentional blackouts may be taking place.[459] Staffed with about 6,000 workers, these reefers can spend over a year at sea before coming to land. For the countries involved in this transshipment, having fleets indefinitely at sea only increases productivity, while enabling the laundering of lucrative illegal fish stocks and the simultaneous exploitation of crews, who are often trafficked and trapped aboard. These covert practices drive up profits and exploit loopholes in national surveillance measures and governance.

Transshipment in South America has not just had a profound impact on local economies, but also on ecosystems. Illegal, unreported, and unregulated fishing fleets seek squid, hake, whiting, Patagonian toothfish, and Atlantic cod, depleting Argentina's main commercial fish stock and disrupting food chains, which in turn affects larger marine mammals. There are no exact measures of the effects of this over-exploitation , but estimates place the amount of squid caught by foreign fleets at 600,000 tons a year, worth $ 600 million,[460] which has also been linked to abrupt dips in sea lion and penguin populations. At the same time, a lack of regulation surrounding the discharge of pollutants from long-distance fleets also has enormous environmental consequences.

459. Kimbra Cutlip, "What Can We See When AIS Signals Disappear?" Global Fishing Watch (July 24th, 2017), https://globalfishingwatch.org/data/what-can-we-see-when-ais-signals-disappear/.

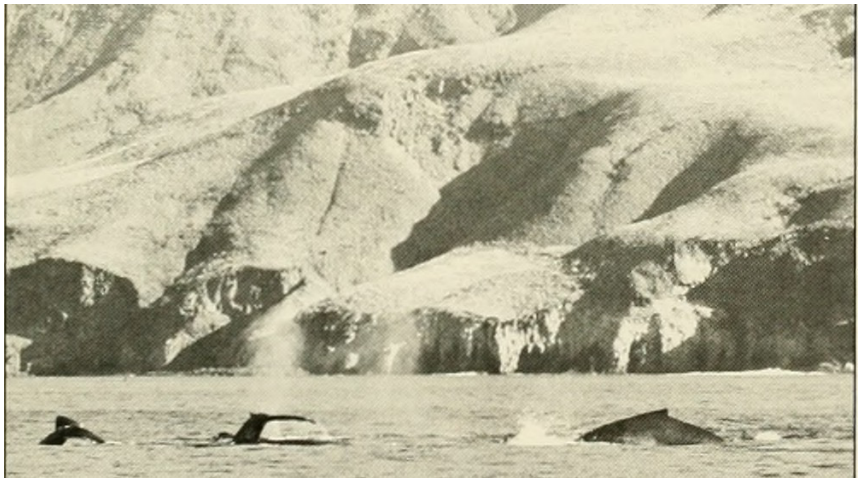
460. "China on the brink of fishing conflict in South America," Dialogo China (May 11, 2016), https://dialogochino.net/en/trade-investment/6117-china-on-the-brink-of-fishing-conflict-in-south-america/.

When attempting to close these loopholes, a combination of both technological and legislative approaches should be drawn on.[461] The use of technology could mean a moratorium on transshipment on the high seas implemented through regional fisheries management organizations (RFMOs), as well as the national jurisdiction of coastal states. In terms of legislation, greater transparency is required to monitor those who evade the law, which could mean enforcing unique vessel identifiers for fishing vessels (such as IMO numbers), mandating publicly-available vessel tracking, or adopting a global catch documentation scheme.

Text by Dolly Church

**Humpback Whale Migrations**

Humpback whales embark on a lengthy annual migration from numerous regions around the world, moving from high-latitude, food-abundant feeding grounds to warmer low-latitude waters where they go to calve. One such migration route, made by the Southeastern Pacific population begins along the Western coast of South America, as far North as Colombia, and traverses the length of the continent's coast down to the nutrient-rich waters of the northwest Antarctic. At approximately 8,300 kilometers, the journey south and back again is the longest known migration of any mammal.[462]



→ Image from 'Cetaceans of the Channel Islands National Marine Sanctuary', from Internet Archive Book Images. No known copyright restrictions.

Adult whales do not eat while they are in the warmer, oligotrophic equatorial waters. They are there as these conditions are essential for the growth of calves, allowing them to reach reproductive maturity most efficiently, due to the warmer sea temperature and reduced threat of predators. In some cases, however, supplemental feeding has been observed from Southern Hemisphere populations, including along the coast of South America,[463] suggesting that the abundance of food owing to the produc-

461. Lacey Malarky and Beth Lowell, "No More Hiding at Sea: Transshipping Exposed," OCEANA USA (February 22, 2017), https://usa.oceana.org/sites/default/files/oceana_transshipping_exposed_report_final_0.pdf.

462. Kristin Rasmussen et al., "Southern Hemisphere humpback whales wintering off Central America: insights from water temperature into the longest mammalian migration," *Biology Letters* vol. 3, no. 3 (June 2007), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2390682/.

463. V. Andrews-Goff et al., "Humpback whale migrations to Antarctic summer foraging grounds through the southwest Pacific Ocean," *Scientific Reports* vol. 8, no. 1 (August 2018) https://www.nature.com/articles/s41598-018-30748-4

tivity of the Humboldt Current offers the whales additional opportunities to renew their energy stores before the migration South. Having reached the cold, nutrient rich waters of the West Antarctic, the whales spend the winter months foraging for their primary food sources, krill and small fish. As there are several migrating populations of humpbacks, there is also overlap in the regions they frequent for feeding and calving. Northeastern Pacific humpback whales, for instance, have been observed in the Central American waters typically occupied by the southeastern Pacific population. They have been determined to share certain genetic traits with their Southern Hemisphere counterparts suggesting "a trans-equatorial exchange" between populations occupying the Central American coast.[464]

As the Anthropocene ocean continues to change, the stability of this migration is under threat from both the immediate and secondary effects of human activity. Constant anthropic presence in the region increases the likelihood of vessel strikes as well as disturbance from persistent noise pollution and overwhelming tourism. Moreover, as one of the planet's most productive marine regions, the ever-growing presence of fishing fleets also increases the chance of entrapment of whales in fishing gear. In terms of the earth system forces that sustain the environmental conditions for the Humpback's seasonal migration, climate change has caused unprecedented change in ENSO cycles, as well as ice melt and changes to the bio-physical pump that maintains the flow of the Humboldt Current. This has implications for availability of food for the whales and the timing of the migration itself. For instance, the extent and timing of ice melt in the Antarctic is an influencing factor on when and how far south the whales forage in the winter months.[465] The effects of this shift have been noticed at the equatorial latitudes where observations of whales wintering off the coast of Ecuador have noted that they are underweight and overburdened with parasites. Scientists speculate that the whales are travelling further and earlier to account for sparse availability of krill due to warming ocean temperatures.

As this trajectory highlights the various forms of data required to understand the Humboldt current and those reliant on it, this significant migration of megafauna adds an important more-than-human layer of sensing.

Text by Eirini Lemos

464. Rasmussen et al., "Southern Hemisphere humpback whales wintering."
465. Andrews-Goff et al., "Humpback whale migrations."

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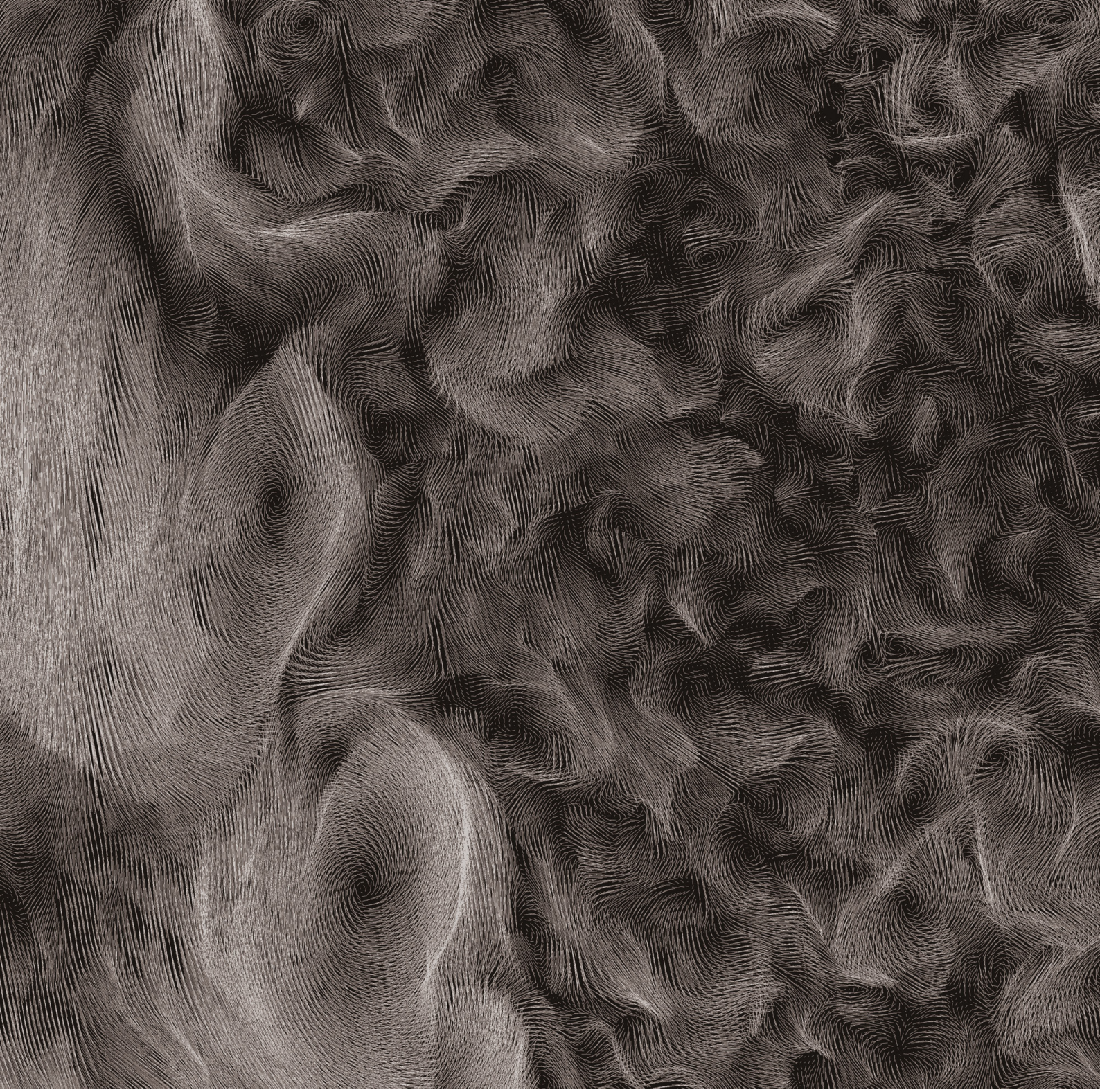

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