POTENTIAL IMPACTS OF SEA-LEVEL RISE ON MARITIME POLITICAL GEOGRAPHY

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For millennia, human communities have adopted agreements governing the rights of political entities to control particular maritime areas and resources. These arrangements have often served to reduce the potential for conflict, but they are also frequently contested. Challenges to maritime legal arrangements have typically been based on conflicting interpretations of historical sovereignty claims and different approaches to the specification of the coastline features from which maritime claims might be measured. The fact that the physical environment might change over time, however, has been almost entirely ignored.[1]

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International Studies Journal (ISJ), Vol. 10, No. 2, Fall 2013, pp. 165-182.

1. There are a few exceptions, notably Freeston and Pethick 1994 and Caron 1990, 2008.

The tendency to treat the physical environment as a constant is not surprising given the lack of attention to environmental change in the laws and proceedings that govern the rights and obligations of states in the maritime arena. The 1982 Convention on the Law of the Seas (United Nations 1982) makes no reference to the possibility of environmental change. Yet the past decade has seen environmental changes that are having growing impacts on where, precisely, seas and coastlines are located. Moreover, scientific studies suggest that those impacts are likely to increase during the twenty-first century (IPCC 2007). Those concerned with maritime legal practices can ill afford to ignore these developments, for they are likely to alter long-established arrangements and introduce new international relations challenges.

The goal of this paper is to encourage thinking about the potential significance of climate change for maritime legal regimes. The paper begins with an overview of the nature and likely impacts of climate change on the world's shorelines and islands and a consideration of the types of maritime legal practices that are likely to be affected by such changes. This section is followed by an assessment of which parts of the globe are likely to face the greatest legal challenges resulting from sea-level rise. Attention then turns to some of the geopolitical consequences that may follow from shifting legal challenges. The paper concludes with a few suggestions about how future climate-change-related conflicts might be avoided, as well as a few thoughts about the implications of this study for the field of political geography.

THE POTENTIAL IMPACTS OF CLIMATE CHANGE

There is growing evidence that increasing concentrations of human-produced greenhouse gases are altering the atmosphere in ways that are affecting global climate. Currently, several studies indicate that the

global average surface temperature increased 0.6 °C over the 20th century (IPCC 2001). During the same timeframe glaciers melted at an accelerating rate and the heat content of the oceans increased. Working together, these processes produced a rise in sea level during the twentieth century that averaged 1.7 ± 0.3 mm per year—and that figure hides an accelerating rate of sea-level rise on the order of 0.013 ± 0.006 mm per year (Church and White 2006). Moreover, most climate models show that these trends will be amplified during the coming decades. The models used in the 2007 report of the Intergovernmental Panel on Climate Change show, on average, a rise in sea levels during the twenty-first century on the order of 0.4 meters (IPCC 2007, 70), and many scientists view that figure as conservative (Pearce 2007). Indeed, the IPCC report estimate uses a rate of glacier melt that is lower than current measurements indicate—suggesting that the world may be facing a sea-level rise of a meter or more by 2100 (Caron 2008). Moreover, scenarios of sea-level rise on the order of 5 to 7 meters are predicted if the Greenland and West Antarctic ice sheets were to melt completely (IPCC 2008, 16).

Sea level rise will not be uniform throughout the world, but even using relatively conservative estimates, most coastlines will likely be altered by a warming climate—with significant implications for maritime legal and naming regimes. To begin with the legal side of the equation, the 1982 Convention on the Law of the Seas gives states a territorial sea extending 12 nautical miles (n.m.) from their coastlines, a "contiguous zones" extending 24 n.m. from their coastlines, and an exclusive economic zones (EEZ) extending 200 n.m. from their coastlines(United Nations 1982).[1] Moreover, states

1. A state has complete sovereignty over its territorial seas, and it may exercise the control necessary to enforce its laws on fiscal transactions, immigration and sanitation in the contiguous zone. States have the right to control resources in the EEZs, but other states have navigation rights in the portions of the EEZ that extend beyond the territorial sea (United Nations 1982).

have sovereign rights over their continental shelves up to 350 n.m. from their coastlines. State's coastlines are calculated using a baseline principle that corresponds to the "low water mark" along a coast (Tanaka 2006).

Clearly, the low water mark will be affected by rising sea levels – opening up questions about long-established maritime arrangements. But the problem does not end there because what counts as a baseline will be altered as well. The rules on such matters date back many decades when an expansionist approach to establishing baselines was adopted in the 1930 Conference of States in The Hague (Caron 1990). The expansionist approach authorizes "the most insubstantial, sometimes ephemeral and transient, geographic features to serve as anchors for baselines, thus maximizing for each coastal state the reach of their oceanic zones into the ocean" (Caron 2008: 5-6). Under this approach, rocks that are barely above the water at low tide can be used to demarcate a state's territorial sea and contiguous zone, and very low-lying fringing reefs and small islands that can sustain some kind of habitation can be used as baselines for determining the extent of a country's EEZ. The problem, of course, is that these sorts of features are particularly vulnerable to sea-level rise.

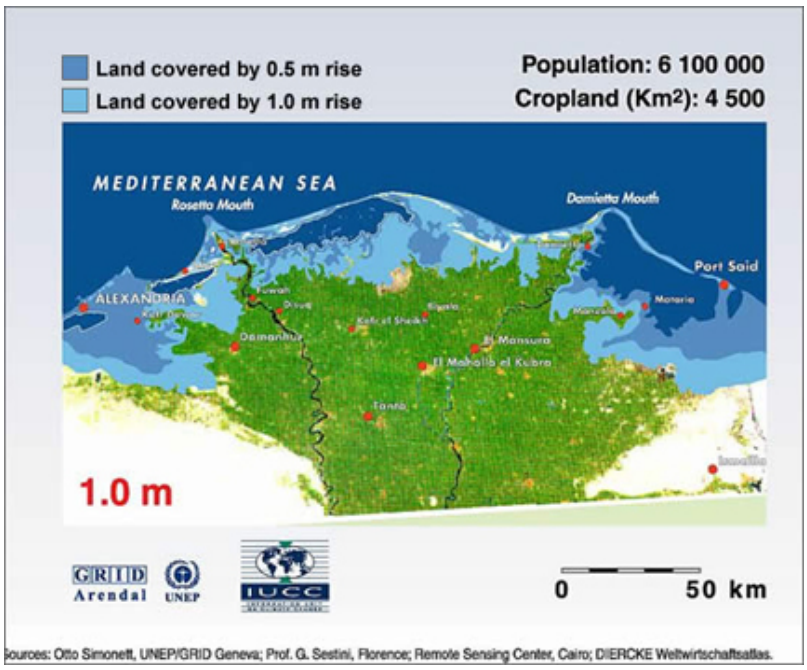
The 1982 Convention on the Law of the Seas does not set forth rules for changing oceanic boundaries if coasts change, but legal scholars have read the Convention to require such changes (Caron 2008, 11). We are thus facing the prospect of significant adjustments to the map of state control over the oceans as small, low-elevation islands and fringing reefs become submerged—changes that could complicate existing maritime disputes and raise new ones. Sea level rise could also alter the position of the "closing lines" that form the baseline when coasts are punctuated by sounds or bays. Under the 1982 Convention on the Law of the Seas, the boudaries of a state's oceanic rights are not pulled in a landward direction if the openings to

sounds or bays are not wider than 24 n.m. It follows that a rise in sea level that ended up widening the mouth of a sound or bay (by submerging a cape) could also have an impact on a state's seaward rights if that widening pushed the opening over the 24 n.m. threshold.

The challenges presented by rising sea levels are dramatically illustrated by the disappearance of two uninhabited islands in the Pacific atoll state of Kiribati and to the island of Suparibhanga in the Bay of Bengal. In 2006 the first inhabited island vanished below the surface of the sea: the Indian island of Lohachara in the Bay of Bengal where the Brahmaputra and Ganges Rivers flow into the Bay (Lean 2006). Two-thirds of the near-by populated island of Ghoramara has been inundated, and the entire island is in danger of disappearing. The same fate may soon befall the Carteret Islands off Papua New Guinea (*ibid.*).

To turn to another example, along the east coast of Greenland the melting of the island's ice sheet has revealed that what was once thought to be the tip of a peninsula is in fact an island (McCarthy 2007). (The island has already been given the name Warming Island (Or UunartoqQeqertoq in Inuit) by American explorer Dennis Schmitt, who has long studied the area.) Similar circumstances may well occur in other parts of Greenland or along the coasts of Antarctica. Delta areas will likely be particularly vulnerable to inundation by rising seas. A visualization produced by UNEP/GRID-Arendal shows how the Nile Delta would be altered if sea levels were to rise by 1 meter (Figure 1).

Figure 1: Expected changes in the Nile Delta brought about by sea-level rise (from Ward 2007)



As the figure shows, features such as Lake Idko and Lake Burolos would effectively disappear. At the same time, new bays and inlets would be created.

AREAS OF PRINCIPAL CONCERN

Because some coastal areas are much lower lying than others and because sea-level rise will not be as great in some parts of the world as others, some coastal areas will face greater global-warming-induced sea-level rise than others. A sense of the overall geography of the issue can be gained by comparing a map of areas likely to be inundated by a 1-meter rise in sea level (Figure 2) and a map showing comparative sea-level changes over the past decade and a half (Figure 3).

Figure 2: Coastal areas subject to inundation in the event of a 1-meter rise in sea levels. (Source: Center for Remote Sensing of Ice Sheets 2008)

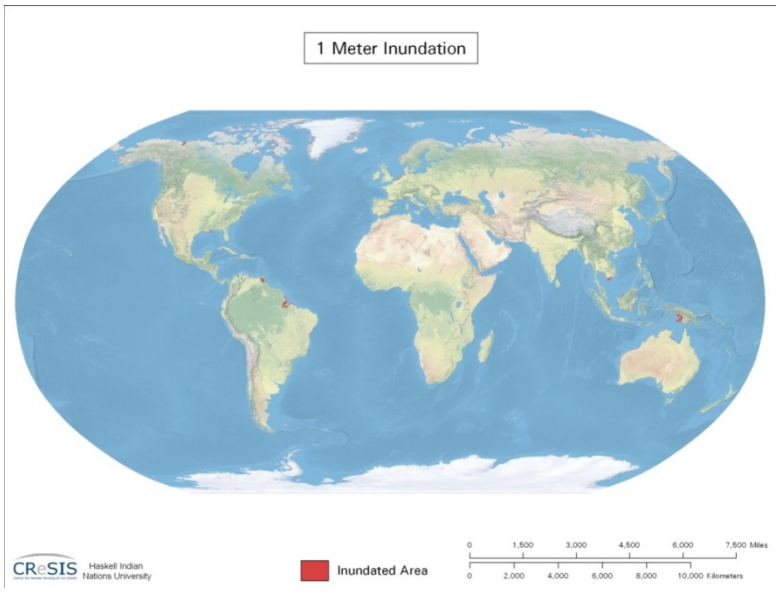
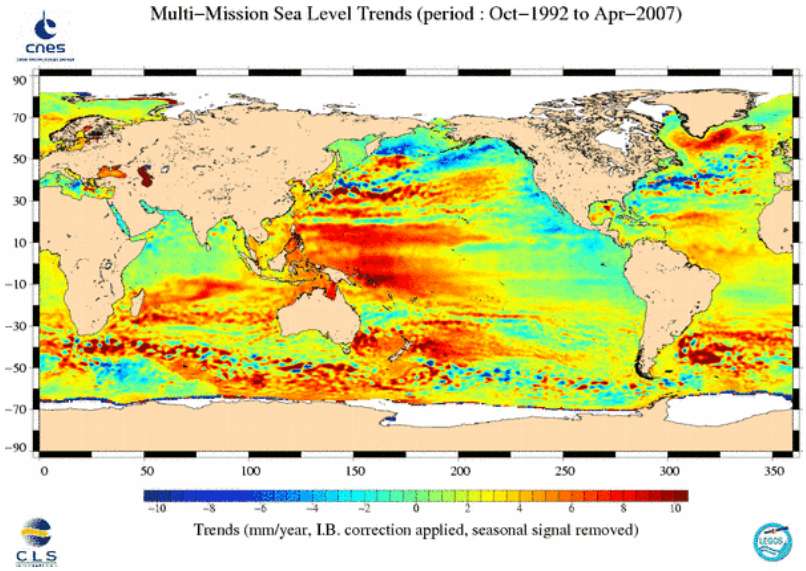


Figure 3: sea level variation trends since 1992



Source: CLS/LEGOS, in AVISO 2008

Taken together, the figures suggest that the South Pacific and Southeast Asia are likely to face particular challenges from rising sea levels. But some other regions will also be implicated: notably southeastern North America, eastern South America, and northwestern continental Europe, as well as parts of the northeastern Bay of Bengal, the Mediterranean, and parts of the Arctic (not shown on the sea-level trend map).

The foregoing list of regions strongly corresponds to the list of places where sea-level rise is widely considered to represent a significant public threat (Table 1).

Table 1 Areas Where Sea-Level Rise is a Particular Concern

Arctic
Yukon Delta (Alaska)
Liberia (selected areas)
North America
Louisiana/Mississippi River Delta
Southern Florida
South America
Amazon Delta (Brazil)
Orinoco Delta (Venezuela)
Europe
The Netherlands
Northern Belgium
Po Delta – Venetian Lagoon (Italy)
Rhône Delta (France)
Africa
Nile Delta (Egypt)
South Asia
Jaffna Peninsula (Sri Lanka)
Southern Bangladesh
Sundarbans (Bangadesh)
Southeast Asia
Mekong Delta
Most of the Merauke Regency of Papua Province, Indonesia
Oceania
Multiple small island states

The patterns suggested by the maps and the table were anticipated more than a decade ago (see Freestone and Pithick 1994), and in some places long-established coastlines are already being altered. In the South Pacific sea level rise is threatening the very existence of countries such as Tuvalu—a state made up of nine atolls and coral islands, where the highest elevation is only 4 meters above sea level (Marks 2007). Other threatened states include Kiribati, Vanuatu, and the Marshall Islands (Marks 2006). The most critical immediate issue, of course, is the loss of habitable and arable land. But rising sea levels can also have significant implications for jurisdictional regimes and naming practices. As Muncel Chang (2000) points out, "Kiribati controls 1,370,300 square miles of ocean, an astounding 4,890 times its own land." The continuing disappearance of some of the state's 33 islands (two uninhabited islands have already disappeared) could shrink Kiribati's EEZ by tens of thousands of miles.

GEOPOLITICAL IMPLICATIONS

The complex interactions between climate changes and maritime legal regimes have significant geopolitical implications. Three cases are illustrative: the scramble for control of the Arctic, the stand-off in the South China Sea, and the rise of new alliances emerging out of shared climate-change concerns.

THE ARCTIC

The Arctic emerged as an area of "co-operation and inclusion" (Heininen and Nicol 2007, 134) in the post-Cold War era—in part because it was seen as a region of limited economic or geostrategic value. But climate change is altering that calculus, leading to

potentially momentous social, economic, and political shifts (ACIA 2004). Recent years have seen both the planting of a Russian flag on the North Pole's seabed as part of the *Arktik-2007* polar expedition and a significant increase in Russia's northern military presence. These developments reflect the fact that, as the ice melts in the north, major oil and gas reserves are becoming accessible (Hargreaves 2006) and a Northern Sea Route is opening up (Borgerson 2008).

Given the shifting value and importance of the Arctic in a warming world, some have predicted unavoidable "collisions of interests" between Norway and Russia over competing claims in the Barents Sea (Tsyganok 2008). The case should not be overstated; state-controlled companies representing the two countries have agreed to work together to develop the Shtokman gas field. Moreover, exploiting Arctic resources will likely require Russia to enter into financial and technological partnerships with external entities (Zernova 2005). But Russia's interests in the Arctic are not just economic; they are cultural-historical as well. As explained by the leader of the 2007 flag-planting expedition, ArturChilingarov:

> *Russia has always extended to the north. The Arctic is our native land, always was and will remain Russian. We planted the flag on the ocean's floor, where no other person has ever been. I don't give a damn what foreigners have to say (quoted in RossiiskaiaGazeta 2007).*

Chilingarov's statement suggests that Russia's northern focus is likely to intensify in the years to come. The *Arktik-2007* flag-planting episode is tied to a particular position Moscow is taking on the extent of Russia's continental shelf. It is indicative of a heightened concern with specifying and patrolling Russia's maritime rights in the Arctic and suggests that Russia is likely to continue to adopt an aggressive position on the location of its baselines and resist any attempt to pull

them back if the Russian coastline recedes in the wake of sea-level rise.

THE SOUTH CHINA SEA

The South China Sea has long been an area of particular contestation among states over maritime rights. Controversy centers on the status of the Spratly Islands, which include some 100 low-lying reefs, islets and islands, and involves the states of China, Malaysia, the Philippines, Taiwan, and Vietnam (Haller-Trost 1990). A certain degree of stability in the South China Sea was achieved in the mid-1980s as a result of an agreement brokered by the Association of Southeast Asian Nations between China and ASEAN member states. And more recent agreements have raised further hope that conflict can be avoided.

Global-warming-induced sea-level rise, however, could alter the situation in significant ways. Most of the interested states seek to advance their position by maintaining some kind of presence on barely habitable reefs and islets. With sea-level rise, the ability to maintain this sort of presence will likely become increasingly difficult—leading to two possible outcomes: (1) the abandonment of some features or (2) the expansion of some features through artificial means. The former approach could fundamentally weaken claims rooted in the 1982 Convention on the Law of the Seas, so that approach is likely to be seen as a last-resort alternative. Instead, states may well follow the example set by Japan in its efforts to keep the tiny "islands" of Okinotorishima from collapsing into the sea.

Okinotorishima is an atoll in the Pacific Ocean with two small areas rising less than 60 cm out of the sea at high tide. (The atoll is located some 1700 kilometers to the south of Tokyo and 1500 kilometers off the east coasts of Taiwan and the Philippines.) In an

effort to make Okinotorishima able to sustain human habitation or economic life—the requirement that must be met for Japan to declare an EEZ around Okinotorishima under the 1982 Convention on the Law of the Seas[1]—the Japanese government has spent billions of yen constructing a steel and concrete support system on the atoll (Yoshikawa 2005). The devotion of resources to build up Okinotorishima may set an example that will be followed in the South China Sea—a project that might preserve the territorial status quo in the face of rising sea levels, but would arguably be enormously wasteful of regional resources and have unfortunate ulterior environmental impacts.

NEW ALLIANCES

While less directly related to maritime legal or naming regimes than the prior two examples, global-warming-induced sea level rise has created at least one new geopolitical alliance: the Alliance of Small Island States (AOSIS). As the organization's website (AOSIS 2007) explains:

> *The Alliance of Small Island States (AOSIS) is a coalition of small island and low-lying coastal countries that share similar development challenges and concerns about the environment, especially their vulnerability to the adverse effects of global climate change. It functions primarily as an ad hoc lobby and negotiating voice for small island developing States (SIDS) within the United Nations system.*

The alliance consists of 43 member states from all over the world that are pooling their efforts to lobby the United Nations and other national

1. At stake is an EEZ of over 400,000 km² around Okinotorishima.

and international bodies on climate-change matters. More specifically, they are seeking to raise awareness of the threat that sea-level rise presents to their countries and to promote policies that will both help curtail greenhouse gas emissions and facilitate adaptation efforts.

In the 1990s the AOSIS initiative was described as "one of the potentially most important developments in international environmental diplomacy of the decade" (Davis 1996). Although this claim is open to debate, it suggests that the AOSIS—and other novel alliances that might arise in the wake of a changing environment—could come to play a role in international discussions of maritime legal and naming issues. Traditionally such discussions have been dominated by states or long-established supranational bodies (e.g., the United Nations and the European Union). It is useful to recognize, however, that climate change could alter some of the building blocs of international relations, giving new actors a voice in the agreements—and the disputes—over the control of the seas.

CONCLUSION

The time when studies of maritime legal arrangements could treat the physical environment as a constant has come to an end. Sea-level rise is proving to be one of the most dramatic consequences of climate change, and resultant adjustments in the geographical configuration of coasts, islands, and seas will have inevitable implications for maritime regimes. Among the more serious consequences of this state of affairs is that seemingly settled arrangements could become unsettled, and new issues could emerge that would pit states against one another.

There are no easy solutions to the destabilizing potentials that accompany climate change in the maritime arena, but early recognition of the problem can help. In some cases anticipatory agreements could be drawn up stabilizing existing maritime

understandings (see Caron 2008). In other cases, agreements could be made that would obviate the need for states to engage in wasteful Okinotorishima-like initiatives. And awareness of some of the implications of sea-level rise could lead to interstate efforts to help stressed coastal populations and ecosystems—in the process fostering a culture of cooperation that could be of value as states confront differences over maritime legal matters.

This paper is only an introduction to this issue, however. As our understandings of the particular physical geographic implications of sea-level rise become more sophisticated, it is important to bring those understandings into our studies of political geographic matters. Maritime legal arrangements provide an important example of how and why this must be done. Only very recently are highly detailed mapping initiatives providing insights into the coastal changes that will likely unfold as the seas continue to rise (e.g., the maps of the eastern seaboard of the United States being produced by the U.S. Climate Change Science Program). Such maps highlight the range of pressures that will be placed on legal norms. They point to the need for more detailed, careful consideration of the impacts of a changing environment on the assumptions and practices that are at work in the global maritime arena. ❖

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