16
Holding Back the Waves? Sea-level Rise and Maritime Claims*

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Abstract

Sea level rise has the potential to influence the location of baselines along the coast from which claims to maritime jurisdiction are made. Accordingly, sea level rise may have adverse impacts on the extent of national maritime claims. This article provides a brief discussion of sea level rise before exploring the link between potentially variable baselines and the outer limits to maritime claims. Options to address these challenges are then discussed.

A. Introduction

Among the multiple threats posed by the impacts of climate change on the oceans is sea-level rise. This is likely to be especially problematic if the rise in sea level is significant and critically rapid. Sea-level rise of this nature would inevitably present disastrous threats to numerous coastal states. This is especially the case given that longstanding trends in global population movements from interior and predominantly highland locations to lowland and frequently coastal contexts have led to heavy urbanisation in low-lying coastal areas. Indeed, it has been estimated that a sea-level rise of 1 metre would inundate territory which is presently home to around 60 million people.[1] Moreover, some particularly low-lying coastal areas such as the mega-deltas of the world, including those of Vietnam's Mekong and Red Rivers in the Asia-Pacific, are likely to be particularly susceptible to the threat of inundation, as large areas are actually below mean sea level at present sea levels.[2] For instance, it has been estimated that the aforementioned 1 metre

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* This chapter draws heavily on the author's earlier contributions, particularly: Schofield & Arsana (2012); Schofield (2011); Schofield (2009).

1 See, for example, Ananthaswamy (2009:26, 30).

2 Doyle et al. (2010).

rise in sea level could displace more than 7 million inhabitants in the Mekong delta area alone.[3] Further, even if not permanently inundated, climate change and sea-level rise are likely to make low-lying coastal areas more vulnerable to periodic flooding as a consequence of an increasing incidence of extreme weather events, leading, for instance, to storm surges occurring on top of an elevated base sea level.[4] In addition to threats to populated coastal areas, concerns have been raised over the potential impacts of increased salt water intrusion on agricultural land close to the coast, as well as valuable coastal environments and habitats such as wetlands and mangroves, as a consequence of sea-level rise.[5]

Perhaps, inevitably, these threats to land territory and the populations, infrastructure and property associated with the loss of these areas have tended to dominate the concerns of policy makers in this context. There is, however, a further significant potential threat to the spatial extent of coastal states, a threat with respect to offshore rather than territorial spaces, and that is that sea-level rise will lead to the retreat of territorial sea baselines inland, leading to significant reductions in the scope of national claims to maritime jurisdiction. This chapter focuses on the potential threat that sea-level rise poses to national maritime claims and suggests potential options to address the challenges that arise.

B. Sea-Level Rise

While an in-depth discussion of sea-level rise is beyond the scope of this chapter, it is worth observing that there is broad agreement in the scientific community that sea levels are rising and doing so at an increasing rate.[6] What remains uncertain are the critical issues of the degree to which the sea will rise and how swiftly it will do so. In large part, these uncertainties stem from the multitude of complex factors that may contribute to sea-level rise (and fall) and the interplay between them.

For example, although the melting of glaciers and other grounded ice are well known and potentially very significant contributors to sea-level rise, the extent and speed of their melting remains highly debatable. The possi-

3 UNDP (2011).
4 Gornitz (1995:529).
5 Freestone (1991:119–122).
6 See, generally, Schofield (2011).

bility of the melting of major land-based ice sheets, resulting in massive and abrupt sea-level rise has been described as one of the major climate "wild cards".[7] Indeed, even relatively moderate melting of such huge ice sheets as a result of climate change would have profound impacts on global sea level. However, as a consequence of the considerable uncertainty that surrounds the issues of whether and how swiftly land-based ice sheets such as those of Antarctica and Greenland are melting, the Intergovernmental Panel on Climate Change (IPCC) did not factor in this possible loss of ice. This led to its relatively moderate predictions in the *IPCC Fourth Assessment Report* of 2007. Consequently, the IPCC's estimates of the range of sea-level rise by 2100 of between 0.18 and 0.59 metres above 1990 levels, with a mid-range prediction of 40 centimetres,[8] have been criticised as being "remarkably conservative" and as being the victim of reaching "lowest common-denominator conclusions".[9]

It has also been recognised that sea-level rise is a phenomenon that exhibits marked spatial and temporal variability. The diverse range of factors that can influence sea levels across a range of scales tends to lead to significant uncertainties over measurements and the causes of sea-level changes. Sea level varies diurnally, under the influence of the tides, but also seasonally, regionally and inter-annually. Further, intricate atmospheric-oceanic interactions can result in significant regional variations in sea level spanning multiple years. The sea-level rise 'signal' has to be set against (and distinguished from) the background of 'noise' of tidal cycles and of climatic variations, such as the El Niño Southern Oscillation (ENSO). Sea level is also influenced by deformations of the earth's crust, for instance through the process of isostatic rebound or uplift already referred to above, as well as vertical displacements associated with tectonic movements. Additionally, anthropogenic activities can also substantially influence sea-level rise, either enhancing sea-level rise, for instance through deforestation promoting run off of water into the oceans, or countering it, for example through the building of dams.[10] Consequently, the IPCC concluded in its Fourth Assessment Report of 2007 that sea-level change is "highly non-uniform spatially", not-

7 See Walker & King (2008:75–80).
8 IPCC (2007:36–41).
9 McKibben (2007). See also Ananthaswamy (2006:26), who notes that there is a "growing consensus" that the IPCC estimates are "wildly optimistic".
10 On these factors, see, generally, Schofield (2011).

ing that in some regions rates of rise are several times higher than the global mean rise, while in other regions, sea level is falling.

Although uncertainties persist regarding the scale and rate of sea-level rise, perhaps the critical point in this context is that, even if only relatively moderate sea-level rise were to occur, such limited vertical change would nonetheless be likely to give rise to substantial shifts in the location of the coast horizontally where low-lying, shallow gradient coastlines are under consideration.[11] As noted above, major population centres are concentrated on the coast, such that this scenario represents a potentially catastrophic scenario. This is especially the case for developing states with large populations located on low-lying territory, such as on the deltas of the Bramaputra and Mekong Rivers in Bangladesh and Vietnam respectively.

C. Ambulatory Baselines and Shifting Limits

I. Baselines and Claims to Maritime Jurisdiction

The United Nations Convention on the Law of the Sea (LOSC) of 1982 provides the generally accepted legal framework governing maritime jurisdictional claims. The LOSC has gained widespread international recognition and, at the time of writing, 163 states had become parties to it. A key achievement of the LOSC was the agreement on spatial limits to national claims to maritime jurisdiction. Consequently, maritime claims are predominantly defined as extending to a set distance from baselines along the coast.

Measured seawards from its baselines, a coastal state is entitled to claim a series of zones of maritime jurisdiction provided for in accordance with the LOSC. These zones include a territorial sea of 12 nautical miles (nm) (LOSC, Article 3), a contiguous zone out to 24 nm from baselines (or 12 nm from territorial sea limits) (LOSC, Article 33), an exclusive economic zone (EEZ) out to 200 nm from baselines (LOSC, Article 57) and continental shelf rights that may extend up to 350 nm or even further in certain circumstances (LOSC, Article 76).[12]

11 See, for example, Leahy et al. (2001).

12 The outer limits of the continental shelf where it extends beyond the 200 nm exclusive economic zone (EEZ) limits, unlike the limits of other zones that are based solely on a distance measurement, depend also on the geology and geomorphology of the seabed. That is why determining the outer limit of the continental shelf is a more

Coastal states have multiple options with respect to choice of baselines. These include straight baselines (LOSC, Article 7), lines closing the mouths of rivers (LOSC, Article 9) and the mouths of bays (LOSC, Article 10), as well as baselines related to ports (LOSC, Article 11). Further, a state that qualifies as an archipelagic state according to Article 46 of the LOSC can designate archipelagic baselines "joining the outermost points of the outermost islands and drying reefs of the archipelago" (LOSC, Article 47). However, the predominant type of baselines in use globally comprise "normal" baselines which, in accordance with Article 5 of the LOSC, are coincident with the low water line along the coast as marked on large scale charts. It is also important to note that the various straight-line type baselines outlined above still depend on normal baselines to an extent, as they need to be anchored back to normal baselines.

Irrespective of the type, baselines are vital in defining the outer limits of maritime zones claimed by a coastal state. Landwards of a coastal state's baselines lie either its land territory, including the inter-tidal foreshore landwards of normal low-water line baselines, or internal waters. Baselines serve as the starting point from which the outer limits of maritime zones are measured. In addition, baselines are critical to the construction of equidistance lines between coastal states in the delimitation of maritime boundaries. In this context it is notable that equidistance lines, the construction of which necessarily depends on the use of baselines, have proved to be the most popular method of delimitation by far.[13] Further, the approach adopted by international courts and tribunals in recent international cases relating to the delimitation of maritime boundaries has been to define a provisional boundary line based on equidistance, and then to examine any factors that may justify a modification of the provisional line in order to achieve an equitable result.[14]

II. Dynamic Coasts

It has long been recognised that parts of the coast are dynamic and can change location and configuration in relatively short periods. Indeed coastlines often

complex task than that for other zones of maritime jurisdiction. Nonetheless, distance measurements from baselines remain critical to this task.

13 See, for example, Prescott & Schofield (2005).

14 (ibid.).

change in a cyclical manner over time (alternately shifting seawards through deposition or accretion of material and then landwards as a result of erosion).[15] Of particular note in the present context is that as the low-water line moves in response to sea-level rise, so the normal baselines and the maritime claims measured from them will shift. This is fundamentally because normal baselines are coincident with the "low-water line along the coast as marked on large scale charts officially recognised by the coastal state" (LOSC, Article 5). The location of normal baselines will therefore tend to move, or 'ambulate', over time in accordance with changes in the coast.[16] The long-standing, generally accepted implication of this phenomenon is that as the coast/normal baselines change, so will the maritime jurisdictional limits measured from them. Thus where the baseline advances (for example by the deposition of material along the coast) the outer limits of the maritime claims measured from that baseline will expand seawards. Conversely, where the normal baseline recedes (through coastal erosion) the coastal state may lose maritime areas as their maritime limits are pulled back.

Since normal baselines are represented by the low-water line, sea level is an important issue in the definition of normal baselines. This is a particularly significant issue as normal baselines are the predominant type of baseline worldwide. Moreover, while normal low-water line baselines would seem most obviously susceptible to change due to sea-level rise, as noted above, other types of straight-line type baselines are also potentially threatened by sea-level rise because such baselines need anchoring to the coast, as represented by the low-water line.

Rising sea level will predominantly lead to the retreat inland of the low-water line and thus the normal baseline. This can result in significant knock-on effects on the limits of maritime jurisdictional claims if the base-points on which the limits of such claims depend similarly retreat inland. This threat to the extent of national maritime jurisdictional claims is especially significant for coastal states such as Bangladesh and parts of India in South Asia, as well as Vietnam in Southeast Asia, which have large stretches of low-lying coasts. The maritime claims of states in possession (or even entirely composed) of low elevation islands such as Kiribati, the Marshall Islands and Tuvalu in the Pacific Ocean are also under threat from this phenomenon. Small, remote and low-lying islands can give rise to significant maritime

15 See, for example, Hirst & Robertson (2004). See also, Schofield (2009:408f.).
16 Shalowitz & Reed (2000:185). See also Prescott & Schofield (2005:100–101).

jurisdictional entitlements. However sea-level rise could change the legal status of such insular features. For example, an island that is currently always above the water surface, even during high tide, may eventually disappear during high tide as a consequence of sea-level rise. This could lead to its reclassification from being an island, from which claims to the full range of maritime zones may be made under Article 121(2) of the LOSC, to one of the categories of insular formations from which only restricted maritime claims can be made, such as a rock (LOSC, Article 121(3)) or a low-tide elevation (LTE) (features that are exposed at low tide but are submerged at high tide) (LOSC, Article 13), or even a fully submerged feature that cannot be used to generate maritime claims.

III. Coasts and Zones under Threat

Although, as noted, sea-level rise would seem likely to result in the retreat inland of normal baselines, it is important to recognise the influence of coastal complexity and variability. Accordingly, sea-level rise is likely to result in uneven consequences in terms of impacts on maritime jurisdictional claims.

The gradient of the coast is a particularly important consideration in this context. Where the coastline is relatively steep the impact of sea-level rise will be limited in terms of shifting the location of baselines (and thus the maritime jurisdictional limits derived from them) horizontally. Conversely, where the coastline is gently shelving, even relatively slight changes in sea level vertically can result in significant shifts in the location of the low-water line horizontally, and this in turn can have significant impacts on the spatial extent of national maritime claims.

It is also worth emphasising here that not all of a coastal state's baselines contribute towards the construction of the outer limits of its maritime claims. Maritime limits are commonly constructed through the envelope of arcs method.[17] Consequently only certain base-points along the normal baseline – essentially the outermost points along the baseline such as headlands and offshore islands – will be relevant to the limits of the maritime zones. In contrast, those parts of the baseline that are located on the inner portion of a bay, for example, are unlikely to contribute to the outer limit of maritime

17 Carleton & Schofield (2001:62).

zones. Indeed, the most of the normal baseline is, in fact, irrelevant to the construction of the outer limits to maritime jurisdictional zones.

While large populations occupying low-lying coastal areas on continental coasts are arguably the most at risk from sea-level rise, it is noticeable that the debate on the issue tends to be framed, even dominated, by the concerns of a number of small island states. This focus, especially in the media narrative, may stem from a perception that in contrast to small low-lying island states, continental states have other, higher land to which displaced populations can retreat. Additionally the small island states are well placed readily (and arguably justifiably) to elicit sympathy for their apparent predicament, especially as they can argue convincingly that their contribution to global climate change through the emission of greenhouse gases has been minimal.

Concerns over sea-level rise by, and on behalf of, these states have been in large part prompted by recognition of not only certain states' limited land territory but also of how little of this is elevated above the present sea level. For example the highest point on the territory of the Maldives is only 2.4 m above sea level. The situation is similar in Tuvalu: Enele Sosene Sopoaga, former ambassador and permanent representative of the Mission of Tuvalu to the United Nations, suggested at the 2007 United Nations Framework Conference on Climate Change that sea-level rise was already a "real emergency" for his country.[18] Consequently Tuvalu has been described as being at the "front line of climate change".[19] Analogous concerns also exist for other small relatively low-lying island states.

Moreover, it has been suggested that sea-level rise could ultimately lead to certain low-lying island states being overwhelmed by the waves, and thus losing their status as states. Under international law, codified in the Montevideo Convention on the Rights and Duties of States,[20] states should possess a "defined territory" and a "permanent population", as well as a government and the capacity to enter into international relations with other states (Montevideo Convention, Article 1). The first two of these four requirements could be directly affected by sea-level rise. However, this scenario does not appear likely, at least in the near term. For instance, even if sea level were to rise by 1 m, even though the consequences of this would undoubtedly be

18 Leake (2007).

19 Patel (2006).

20 See Montevideo Convention on the Rights and Duties of States, opened for signature 26 December 1933, 165 LNTS 19 (entered into force 26 December 1934), hereafter the Montevideo Convention.

calamitous, no state would be completely inundated as it stands. That said, even relatively slight sea-level rises might have major impacts on island habitability, for example by impacting on the availability of potable water. These concerns have led to the formation of bodies, such as the Alliance of Small Islands States (AoSIS), mandated to address issues concerning the vulnerability of small island states to climate change.[21]

While there has been mounting evidence that the effects of sea-level rise are resoundingly negative, it has been speculated that sea-level rise might yield unlooked for benefits in terms of its impact on contentious territorial and maritime disputes. In particular, multiple territorial and maritime disputes in the Asia-Pacific, especially in the South China Sea and East China Sea, revolve around sovereignty over small, isolated and, critically, low-lying islands. Such disputes, such as that concerning the Spratly Islands group in the South China Sea, which has proved to be a longstanding source of friction among the multiple claimant states. The small insular features at the centre of these disputes may well be threatened with inundation through sea-level rise, potentially removing the key driver for these disputes, the territory at stake.

The prospect of sea-level rise entirely submerging the fundamental focus of dispute, the islands themselves, and thus arguably resolving the conflict, represents an alluring prospect. Alternatively, sea-level rise might have the impact of reducing the disputed insular features to the status of mere rocks or low-tide elevations, thereby significantly curtailing their capacity to generate claims to maritime jurisdiction, and so serving to reduce or narrow the scope of the maritime jurisdictional dimensions of these disputes.

That said, states do not give up sovereignty claims readily. An example of this is the alleged disappearance of a disputed island, called South Talpatty by Bangladesh or New Moore by India, which could be considered an inadvertent benefit of climate change. However this has not proved to be the case, because not only were reports of the island's demise somewhat premature (it has been reported that the island still appears during very, very low-tide conditions, but at least one of the parties to the dispute, Bangladesh, promptly reasserted its sovereignty claim to the feature.[22] In respect of other territorial disputes over low-lying islands, it remains to be seen whether or not sea-level rise will yet have a positive impact on longstanding contentious

21 See AoSIS website http://www.sidsnet.org/, last accessed 25 April 2013.
22 Wade (2010).

island sovereignty disputes such as that over the Spratly Islands in the South China Sea or will add merely a further layer of confusion and doubt to an already uncertain scenarios.[23]

Notwithstanding mounting evidence suggesting threats to islands and coasts due to climate change, counter-arguments do exist. For example there is evidence that coral atolls have proved to be remarkably robust over long periods, including periods when sea levels were considerably higher than they are now. This suggests that some insular features may be able to adapt naturally to climate change and sea-level rise. This is underpinned by observations in and analysis of 27 coral atoll islands in the central Pacific Ocean, which found that the majority (86 per cent) of these features had either remained stable or increased in area over a 20–60 year period despite reported sea-level rise in the central Pacific region.[24] Indeed it has been argued that uninterrupted sediment flows are necessary to sustain the island-building processes that maintain the integrity of coral reef islands: "[t]he physical dynamics of sediment supply and transport are critical factors in the context of management of rocky and sedimentary oceanic islands."[25] Accordingly, overpopulation of small islands, coupled with inappropriate land uses are important factors affecting the integrity of coral island ecosystems and thus the continued habitability of such features.

D. Response Options

Either for sea-level rise or land subsidence, it is evident that the current normal baselines are ambulatory, which in turn can shift maritime limits measured from them. However there is also a need to have jurisdictional clarity for better ocean space management and thus fixed maritime limits. Four main response options arise in this context: retreat (and relocation), defence (including efforts designed to protect the coast or stabilise baselines physically), preservation of the position of baselines, and fixing the outer limits of maritime zones.

23 Dupont (2008).
24 Webb & Kench (2010).
25 Kenchington (2009).

I. Retreat

Rather than attempting to protect the coast and stabilise its present location, one alternative would be to, in a sense, accept the inevitable and manage the impacts of rising sea level. This can be achieved through approaches that recognise increased dynamism in the coastal zone and thus provide for coastal development that is responsive rather than resistant to change. In this context "planned retreat" calls for coastal development to be removed or relocated once defined "setbacks" or limits for construction are encroached on through coastal erosion.[26]

A more extreme retreat scenario envisages the abandonment of entire islands. For example, the Indian island of Lohachara, located in the Sundarbans region where the Ganges and Brahmaputra Rivers empty into the Bay of Bengal and once home to 10,000 people, was in 2006 reported to have been evacuated because of the effects of sea-level rise, although this was apparently done "as a precaution".[27] Similarly, a decision was made in 2005 to relocate the 2,600 inhabitants of the Carteret Islands of Papua New Guinea.[28] It can be anticipated that such responses will increasingly come to the fore if predictions regarding substantial and rapid sea-level rise prove to be well founded.

II. Defend

There has been a long history of human effort to protect valuable parts of the coastline and thus, often incidentally, in stabilising portions of the baseline along the coast for maritime jurisdictional purposes. Such efforts tend to involve the building of sea defences such as sea walls, groynes and wave reduction structures. Such efforts are intended to prevent or at least delay natural processes of erosion and abrasion.[29]

Similarly, reclamation could also be an option for building up vulnerable coastlines. The Republic of Maldives has started projects to build up some of its large islands through reclamation to ensure that it will have more safe

26 Smith et al. (2011).
27 Lean (2006).
28 IOM (2009).
29 Freestone (1991); Schofield (2009).

refuges for its population.[30] For small islands physical intervention can serve as a means to protect insular status. The classic case is that of Japan's southernmost territory, the small, isolated insular feature, Okinotorishima, around which Japan has constructed a 360° sea wall, vertically higher than the threatened feature extends above sea level.[31]

The drawbacks of the physical approach described are that it may be environmentally unfriendly and that it is also frequently costly. For instance, the mentioned sea wall built for Okinotorishima cost in excess of US$200 million in the 1980s.[32] This is certainly not a preferred option for less developed states like the Maldives, Tuvalu or other Small Island Developing States (SIDS), which appear likely to suffer most from the impact of sea-level rise. This is particularly the case in the context of long, narrow coral atolls.[33]

Physical intervention may also disturb the natural equilibrium of a coast and interrupt sediment flows, leading to serious unintended consequences for the environment in the long term.[34] The building of coastal defence structures can also affect ecologies on local and regional scales, for example by affecting the existence of species and thus changing the native assemblages of the surrounding areas.[35] It can therefore be concluded that the physical intervention approach to stabilising baselines is generally costly and tends to be environmentally and ecologically unfriendly. In addition, physical interventions such as reclamation may spark legal questions concerning the validity of reclaimed coastlines to be used as baselines. An ecosystem-based and sustainable management approach is therefore strongly advocated.[36]

III. Preserve

The other option for stabilising baselines is to take a legal approach. This has been suggested as a means whereby states threatened by sea-level rise

30 Morris (2009).
31 See, for example, Prescott & Schofield (2005:84–85).
32 Brown et al. (1991:84–85).
33 Freestone (1991).
34 Kenchington (2009).
35 Airoldi (2005).
36 Kenchington (2009).

might be able to retain their maritime claims.[37] Two major alternatives to this are fixing the normal baselines or fixing the maritime limits. The LOSC states that the normal baselines of coastal states are the low-water lines depicted on a nautical chart recognised by the coastal states. The key information in this LOSC article is that "a recognized nautical chart" is the legal document on which the normal baselines of a coastal state are declared. However, there is no clause in the article detailing the required technical specifications of the nautical chart. For example, the article specifies neither the age of the chart in question nor whether it needs to be registered or recognised by an international body.

It has been observed in this context that the coastal state may use any chart in defining its normal baselines as long as the chart is officially recognised by the coastal state itself.[38] Arguably, a coastal state could therefore fix its normal baselines by recognising a chart showing such baselines. However, if the baselines were to subsequently move, the coastal state would need to produce different charts officially recognised for different purposes – that is, charts for illustrating baselines as well as those used for navigational purposes. For the latter, a nautical chart has to be regularly revised through surveys to show the most updated coastal environment and important objects, especially those hazardous to navigation.

The potential issue with the use of specific and fixed charts showing baselines is that other states may not necessarily recognise the chart. This can be problematic if two states need to delimit maritime boundaries between them. If one state fails to recognise another state's chart depicting normal baselines, the progress of the delimitation may be hampered. However, it is not unusual for two states to agree on the use of a particular chart for maritime delimitation, even though the chart may no longer depict the current coastline/baselines. A good example of this practice is the maritime boundary delimitation between Indonesia and Singapore in the Singapore Strait, signed on 10 March 2009.[39] Indonesia insisted that Singapore use its normal baselines, as depicted in the original map of 1969, in the delimitation, and Singapore agreed to do so.[40] To anticipate problems caused by disagreement on the use of fixed baselines depicted by a particular chart, coastal states can voluntarily declare their fixed normal baselines in the same manner as states

37 Soons (1990).
38 Schofield (2009).
39 Republic of Indonesia, Ministry of Foreign Affairs (2009).
40 Republic of Indonesia (2010).

usually declare straight or archipelagic baselines. By doing this, protest and disagreement from other states, usually neighbours, can be anticipated well in advance, before the baselines are used for maritime claims and delimitation.

The instability issue of normal baselines may also be partially overcome by the use of straight baselines. However, as noted above, straight baselines were not originally conceived with the aim of fixing baselines in response to global changes such as sea-level rise. Straight baselines can be used in the context of deltas and unstable coasts (LOSC, Article 7 (2)). It would, however, be likely to be problematic to apply such baselines along an entire coastline as a response to sea-level rise. Further, as noted, while straight baselines predominantly consist of imaginary lines, they still require turning points, which should be points somewhere at the interface of land and water during low tide. Such turning points anchor straight baselines to the coast and therefore cannot themselves 'float' offshore, unattached to any point on land. Accordingly straight baselines still require the use of base-points, the location of which depends on the choice of low-water line, which is characteristically unstable. This implies that the use of straight baselines may fix baselines in a particular location or situation, but not fully resolve the instability issues. Another issue with straight baselines is that states tend to interpret Article 7 of the LOSC liberally in designating straight baselines, since there are some uncertainties and ambiguities therein. Thus the straight baselines may be considered excessive by other states and might be contested as a result.

IV. Fix

Fixing maritime limits may be an alternative to stabilising baselines for dealing with changing baselines due to climate change. This would mean that once maritime limits are set they are permanent in terms of location. Hence it would not matter whether coastlines or baselines shift owing to sea-level rise: maritime limits would stay where they are. Should this be adopted, states will not be disadvantaged if there is significant sea-level rise that shifts baselines closer landwards. However some states may not see this as a good option if, for some reason, their baselines shift further seawards. This is possible, for example, if material is deposited along the coast. Ironically, as noted, this appears to have occurred with reference to some Pacific islands, largely as a result of the accumulation of coral debris, land reclamation and

the deposit of sediment.[41] If coastlines or baselines shift further seawards but maritime limits remain fixed, this would be a less than ideal scenario for the states involved. However, considering the prevailing perception that sea-level rise is accelerating, threats to the location of baselines and thus the scope of maritime claims do still exist. This is especially the case since it is unclear whether or not the natural responses that, for example, coral islands have exhibited in the past in response to sea-level variability will be able to cope with the potentially rapid sea-level rise induced by global climate change. This may make the option of fixing maritime limits more attractive to island states in the Pacific that are vulnerable to climate change.

The limits of a coastal state's maritime jurisdiction can be established in one of three ways. First, maritime claims can be generated to the full extent or distance allowed under international law, in the absence of analogous claims on the part of neighbouring states. Second, where overlapping claims to maritime jurisdiction exist, maritime boundaries may be delimited between neighbouring states. Third, the definition of the outer continental shelf limits involves a submission process to the United Nations Commission on the Limits of the Continental Shelf (CLCS) (see below).

Provided a coastal state does not have any neighbours with an overlapping claim to a particular zone, it can define its maritime limits unilaterally. For example, if a coastal state has no neighbours within 24 nm of its baselines it can unilaterally define its territorial sea limits. With regard to this option, the outer limits of maritime zones are commonly defined using the method of envelope of arcs, outlined previously. The limits of such claims are generally dependent on the baselines from which these maritime claims are measured, thus they may move over time as baselines shift. However, it is worth noting that the use of this method employs only relevant base-points along baselines to generate maritime limits. Depending on the shape or configuration of a coastline and therefore its associated baselines, not every point along baselines will affect the location of maritime limits. In other words, while one part of the baselines may be crucial in constructing maritime limits, other parts may be irrelevant. However, it is generally true that baseline changes can shift maritime limits.

The introduction of 200 nm breadth EEZs, in particular, has had a dramatic effect on the scope of ocean spaces becoming subject to the maritime claims of coastal states. It has been estimated that if every coastal state made

41 Webb & Kench (2010).

national maritime jurisdictional claims out to 200 nm (as is predominantly the case) these claims would encompass 43 million nm^2 (147 million km^2) of maritime space. This amounts to approximately 41 per cent of the area of the oceans or 29 per cent of the earth's surface. The extent of the area subject to jurisdictional claims out to 200 nm is thus approximately equivalent to the area of land territory on the surface of the earth.[42] The inevitable consequence of this enormous expansion in national claims to maritime space seawards has been a major proliferation in overlapping claims to maritime jurisdiction and thus potential international maritime boundaries. Indeed there is presently no coastal state in existence that can claim a full suite of maritime zones without overlapping claims. For example, to claim a full 200 nm EEZ, a coastal state must be over 400 nm from its nearest maritime neighbour. Thus every coastal state needs to delimit at least one maritime boundary. However, this situation does not affect the way the breadths of maritime zones are theoretically measured from baselines.

Considering the geographical location of coastal states in the world and the configuration of their coasts, overlapping claims of maritime zones among coastal states is inevitable. As such, maritime delimitation is required to produce maritime boundaries. Maritime delimitation among states is therefore another way for coastal states to define the limits of their maritime zones. While the first option is a unilateral process, maritime delimitation is a bilateral or multilateral process.

The process of maritime boundary delimitation between two or more coastal states is governed by the principles and rules of public international law.[43] International law explains how maritime boundary delimitations should be established. However maritime boundary delimitation is usually resolved either through negotiation among the affected parties or by submission of the case to a third party. This third party can be arbitrators, mediators, courts or tribunals, such as the International Court of Justice or the International Tribunal for the Law of the Sea.

An overlapping EEZ and continental shelf claim exists where the distance between State A and State B is less than 400 nm but greater than 24 nm. If the distance between the two neighbouring states is less than 24 nm then their territorial seas will overlap. This illustrates that maritime boundary delimitation can be required for territorial sea, EEZ or continental shelf,

42 Prescott & Schofield (2005).
43 (ibid.).

depending on the distance between the states in question. In this situation the rules governing maritime boundary delimitation for those different zones are also different. For the territorial sea, for example, it is explicitly stated by the LOSC that "neither of the two opposite or adjacent states is entitled to extend its territorial sea beyond the median line" unless either State involved agrees otherwise or if "historic title or other special circumstances" exist (LOSC, Article 15). A median line or equidistance line can be defined as "a line every point of which is equidistant from the nearest points on the territorial sea baselines of two states."[44] However, the LOSC does not specifically mention methods for delimiting EEZ and continental shelf boundaries in case overlapping claims between two or more states are identified. Instead, the relevant provisions of the LOSC only mention that continental shelf and EEZ boundaries between states with opposite or adjacent coast should be established to "achieve an equitable solution" (LOSC, Articles 74 and 83).

One important issue in this context is that once international boundaries are established they tend to stay where they are. Maritime boundaries do not change unless the parties in question agree. The 1969 Vienna Convention on the Law of Treaties states that boundary treaties are excluded from the rule that a party to a treaty may invoke "a fundamental change in circumstances" as grounds for terminating a treaty.[45] In other words, agreed maritime boundaries are fixed in terms of location, even if the baselines they are constructed from have shifted.

The third option for defining the outer limits of maritime jurisdiction is through submission to a third party. An example in this context is provided by the definition of the outer limits of continental shelf areas located beyond 200 nm from baselines. In order that coastal states may confirm their sovereign rights over areas of continental shelf beyond 200 nm from their baselines, the LOSC provides that such states should make a submission regarding its proposed outer continental shelf limits mainly based on geological and geomorphologic evidence and submit this to the CLCS. The "continental shelf beyond 200 nm from baseline" is commonly termed the *outer* or *extended* continental shelf. Determining the outer limit of the continental shelf where it extends seawards of the 200 nm from baselines in-

44 IHO et al. (2006:18).

45 Vienna Convention on the Law of Treaties, Article 62(2a). In addition, Article 11(a) of the 1978 Vienna Convention on Succession of States in Respect of Treaties provides that a change of states does not affect a boundary established by a treaty.

volves complicated procedures and significant resources. The procedure for the delineation of the outer limits of the continental shelf beyond 200 nm was further specified by the CLCS in its *Scientific and Technical Guidelines*, which were adopted on 13 May 1999.[46] Once the CLCS has delivered its recommendations to the coastal state that state may declare the outer limits of its outer continental shelf, which are "final and binding" when defined "on the basis of" the CLCS's recommendations (LOSC, Article 76 (8)). In other words, even though the outer limit of the continental shelf is not definitive in terms of distance from baselines, unlike the outer limits of other zones, the limit is fixed in terms of its location once it has been properly established.

From the three options to set the limits of maritime jurisdiction elaborated upon here, the first generates unfixed maritime limits, while the latter two establish fixed limits. The shifting maritime limits in the first option result from migrating baselines, especially normal baselines. The inherent dynamism of the coast will inevitably lead to alterations in the location of baselines over time, and this in the present circumstances will necessarily lead to changes in the location of the outer limits of maritime claims. This situation is likely to be exacerbated by sea-level rise. In the second and third options, agreed maritime boundaries and outer limits of continental shelf beyond 200 nm are fixed. This highlights a growing desire on the part of threatened coastal states to fix baselines and the limits derived from them. It can be noted that the challenge of global sea-level rise was simply not contemplated during the drafting of the LOSC. The fact that, in accordance with the LOSC, some maritime limits and boundaries should be fixed does, however, suggest that moving towards declaring and fixing maritime limits which are presently susceptible to change represents a plausible and reasonable response to an unanticipated problem.

E. Conclusions

Sea-level rise has significant potential to have highly problematic effects not just in terms of the inundation of land territory, but also with respect to the extent of coastal state claims to maritime space. This chapter has explored

46 The guidelines are available at http://www.un.org/depts/los/clcs_new/documents/Guidelines/CLCS_11.htm, last accessed 25 April 2013.

some of the issues and uncertainties that arise in relation to the phenomenon of sea-level rise. It has also sought to highlight some of the ways in which the impacts of sea-level rise on claims to maritime jurisdiction are likely to be uneven.

A number of options to address this challenge have been outlined. While physical intervention with a view to stabilising or fixing coastlines and baselines, and thus maritime limits, may work in certain circumstances and situations, the legal fixing of either or both baselines and limits may prove a more feasible solution. This can begin from coastal states unilaterally declaring or even depositing their normal baselines or maritime limits, analogous to the deposition of straight (LOSC, Article 16 (20)) or archipelagic (LOSC, Article 47 (9)) baselines. Once declared on an official chart, normal baselines can remain at the same location until the chart is revised. In addition, normal baselines are those identified "on large-scale charts officially recognised by the coastal State" (LOSC, Article 5) and are not necessarily representative of the actual location of coastlines. This supports the idea of fixing normal baselines by preserving charts assigned for the purpose of depicting baselines. Increasing state practice along these lines can be anticipated.

A more radical approach to fixing baselines would be to amend the LOSC. However, this approach seems unlikely because, even though the LOSC contains amendment procedures, they have never been activated. Further, there appears to be scant enthusiasm for a Fourth United Nations Conference on the Law of the Sea. Such discussion could nevertheless potentially take place through consultations in a technical forum, at least initially, such as the Advisory Board on the Law of the Sea (ABLOS).[47] In line with this idea, a supplementary agreement to the LOSC, such as the fish stocks agreement of 1995,[48] is conceivable. This precedent could be used as a model in approaching the fixing of baselines and/or maritime limits.

47 Schofield (2009).

48 United Nations (1995) Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, adopted 4 August 1995, in force as from 11 December 2001, Geneva, Switzerland: United Nations, available at http://daccess-dds-ny.un.org/doc/UNDOC/GEN/N95/274/67/PDF/N9527467.pdf?OpenElement, last accessed 25 April 2013.

Fixing baselines and/or maritime limits is essentially aimed at preserving the existing rights of coastal states and it can be argued that this is hardly excessive. In addition, this effort is particularly important for small island states which have minimal responsibility for the emergence of the problems related to climate change. The Small Island Developing States (SIDS) have contributed least to the human-induced climate change that is causing sea-level rise, but are affected most by its impacts. It seems only equitable that such states should be able to fix their baselines and maritime limits to preserve their rights over their maritime zones and natural resources to which they are entitled.

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