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Addendum to ‘Climate Change: Options and
Duties under International Law’

AN OCEAN UNDER STRESS: CLIMATE CHANGE AND THE LAW OF THE SEA*

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ABBREVIATIONS

CBD	Convention on Biological Diversity
Convention	UN Convention on the Law of the Sea or LOSC
COP	Conference of the Parties
EEZ	Exclusive economic zone
FAO	Food and Agricultural Organization
FSA	Fish Stocks Agreement
GHG	Greenhouse gases
ICAO	International Civil Aviation Organization
ICJ	International Court of Justice
ILA	International Law Association
ILC	International Law Commission
ILM	International Legal Materials
IMO	International Maritime Organization
IPCC	Intergovernmental Panel on Climate Change
ISA	International Seabed Authority
LAT	Lowest Astronomical Tide
LC	Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter or London Convention
LOSC	UN Convention on the Law of the Sea
LP	Protocol to the London Convention (LC) or London Protocol
MARPOL	International Convention for the Prevention of Pollution from Ships, 1973
MEPC	Marine Environment Protection Committee
NGO	Non-governmental organization
OIF	Ocean iron fertilization
PCA	Permanent Court of Arbitration
RFMO	Regional Fisheries Management Organization
UNEP	UN Environmental Program
UNFCCC	UN Framework Convention on Climate Change
UNTS	UN Treaty Series
VCLT	Vienna Convention on the Law of Treaties
WMO	World Meteorological Organization

1. INTRODUCTION

This report discusses a rather ‘technical’ topic: climate change as it affects the ocean, from the point of view of public international law. The topic is ‘technical’ in the sense that understanding the issues and the measures and policies to be adopted to deal with them, including the use of international law, requires the use of knowledge from natural sciences and engineering, and also requires making use of highly detailed rules of international law. In addition to the scientific and technical aspects, climate change also has significant social and economic implications, which must be taken into account when considering the measures to be taken in response to it. Thus, it is also a very broad topic, and at the outset it should be noted that the report does not attempt to provide a comprehensive treatment of the issues. Some issues will not be dealt with at all, others only briefly, as examples to indicate how international law is being applied to deal with particular problems facing the international community. One issue – sea level rise – will be addressed in some detail, as this is currently by far the most important one requiring a response from international policy makers. Although to a large extent the topic concerns scientific and technological matters, the report will attempt to provide an insight into how international law is being employed and can be further developed to address the unprecedented issues now facing the international community as a result of climate change affecting the ocean. The focus will be on the law of the sea, although a few observations will also be made outside that field of international law.

Climate change started to become an area of concern to the international law of the sea in the 1980s, when the first studies about the impact of global warming on the ocean, caused by the emission of greenhouse gases, began to emerge.¹ Climate change affects the entire planet, and as the earth’s largest ecosystem, the ocean plays a critical role. It already functions as a mitigator of global warming by absorbing most of the added heat, and may offer opportunities for further mitigation, but at the same time it suffers from global warming with serious consequences for coastal populations, food security and biodiversity.² The ocean covers nearly three quarters of the earth’s surface, contains 96% of its living space, provides around half the oxygen we breathe and is an increasing source of protein for a rapidly growing world population. Its biodiversity is important for the entire planet, and increasingly use is being made of it for medicine and cosmetics production. It serves as the highway for transporting goods, and submarine cables on the seabed transfer 90% of all our data communications. It is also a collector of waste, and the place where a large amount of fossil fuel (whose use produces the green-

¹ J.G. Titus, *The Causes and Effects of Sea Level Rise*, in H.G. Wind (ed.), *Impact of Sea Level Rise on Society* (1987), pp. 104-125; S.H. Schneider, ‘The Greenhouse effect: Science and Policy’, *Science* (1989), pp. 771-781; J.D. Milliman, ‘Sea Levels: Past, Present and Future’, *Oceanus* (1989), pp. 40-44.

² First Integrated Global Marine Assessment (see footnote 13).

house gases) is being extracted. About 40% of the world's population lives within 100 kilometres from the coast.³

Before addressing legal issues the report will briefly summarize the facts: the causes of climate change and its effects on the ocean (Section 2), and then deal with some of the possible measures for prevention, mitigation and adaptation that can be taken and that raise questions of international law (Section 3). The rest of the report deals with the law: in Section 4 legal issues relating to measures for prevention or mitigation of the *causes* of climate change will be addressed, followed by an examination of legal issues concerning some (potential) measures for mitigation of and adaptation to the *effects* of climate change. Detailed attention will be paid in Section 5 to the international law questions related to one particular field of adaptation to an effect of global warming, that is to say sea level rise, more specifically the potential loss of entitlement to maritime jurisdictional zones, and ways to prevent this. This will be followed in Section 6 by a brief *excursus* outside the realm of the law of the sea, to the international legal issues related to the possible future disappearance of States. Finally, in Sections 7 and 8 some conclusions will be drawn and propositions and points for discussion presented.

Before addressing all these substantive issues it is necessary to explain briefly the sources of law used in this report. The international law of the sea may roughly be divided into two main areas: the general law of the sea, and the particular law of the sea. The 'general' law of the sea covers the rules concerning the distribution/attribution of competences of States in the ocean, including the main substantive rights and duties of States in the various parts of the ocean, whereas the 'particular' law of the sea covers the more detailed and technical substantive rules concerning activities in the ocean and its protection and preservation.

The general law of the sea is covered by treaty law and customary international law. The main treaty is the 1982 UN Convention on the Law of the Sea (LOSC or the Convention),⁴ which is currently in force for 167 States parties and the European Union.⁵ Among the States not party are the United States, Turkey, Israel, Colombia, Peru and Venezuela. Matters not regulated by the LOSC remain governed by customary international law.⁶ Customary international law also governs the relations between States not parties the LOSC and between a party and a non-party to the LOSC. Many provisions of the LOSC reflect customary international law, but certainly not all. In any case all 'institutional' provisions (those establishing international institutions and dispute settlement mechanisms) are only binding on the parties in their mutual relations.

³ Ibid.

⁴ UN Convention on the Law of the Sea, adopted on 10 December 1982, entered into force on 16 November 1994; 1834 UNTS 397.

⁵ UN DOALOS website, May 2018: <http://www.un.org/Depts/los/reference_files/chronological_lists_of_ratifications.htm#The%20United%20Nations%20Convention%20on%20the%20Law%20of%20the%20Sea>.

⁶ Preamble, last paragraph.

The particular law of the sea is also covered by treaty law and customary international law, but the latter only to a limited extent because of the usually detailed nature of the rules in question. There is a very large number of treaties in many areas of ocean activities, both at the global and regional (or sub-regional) level, as well as many bilateral treaties. They cover such matters as safety of navigation and shipping, including labour standards; fishing, whaling and conservation of marine biodiversity; prevention and combatting of marine pollution from various sources; scientific research; maritime security and law enforcement. They are often negotiated and monitored in the framework of international organizations, such as the International Maritime Organization (IMO), the Food and Agricultural Organization (FAO) and its regional bodies, and the United Nations Environment Program (UNEP) and its regional bodies.⁷ Some treaties have their own supervising and implementation mechanisms, such as a Commission or Meetings or Conferences of States Parties.

The LOSC is the main point of reference for this report. It establishes the legal framework within which all activities in the ocean must be carried out. The Convention was negotiated during the Third United Nations Conference on the Law of the Sea which was held between 1973 and 1982. Although the Convention did take into account environmental concerns, being negotiated shortly after the Stockholm Conference on the Environment, and in a period when the dangers of marine pollution attracted much attention, climate change was not yet an area of concern. As will be seen, for example, sea level rise was not in the minds of the negotiators, so the negotiations and drafting proceeded on the basis of the then-existing knowledge about the physical environment.

How is the LOSC generally being developed further now in response to new problems, needs and interests? The formal amendment procedures for the Convention are cumbersome and have not yet been used. But even before it entered into force the Convention was *de facto* amended: the 1994 Agreement relating to the Implementation of Part XI of the UN Convention on the Law of the Sea⁸ amended a number of provisions of Part XI (on the international seabed area's mining regime) of the Convention. In 1995 another 'Implementing Agreement' was concluded, the UN Fish Stocks Agreement (FSA).⁹ A further Implementing Agreement is being negotiated now by an Intergovernmental Conference on an international legally binding instrument on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction.¹⁰

Art. 319 of the Convention provides for a role of the UN Secretary-General by providing that he shall report on issues that have arisen with respect to the Conven-

⁷ Many provisions of the Convention refer to 'competent international organizations' as the entities authorized or charged with implementing tasks under the provision of the convention.

⁸ 28 July 1994, 1836 UNTS 42; entered into force on 28 July 1996.

⁹ 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, 4 December 1995, 2167 UNTS 88; entered into force on 11 December 2001.

¹⁰ For more information see: <<https://www.un.org/bbnj/>>.

tion, and convene meetings of States Parties. This has resulted in a practice of an annual review process, consisting of annual reports of the UN Secretary-General on the Law of the Sea, annual Meetings of States Parties (mainly charged with taking the formal decisions required by the institutional provisions of the Convention), an annual meeting of the Open-Ended Informal Consultative Process on Oceans and Law of the Sea (UNICPOLOS) in which also non-parties to the Convention participate, followed by debate in the UN General Assembly leading to the adoption annually of a Resolution on Oceans and the Law of the Sea.¹¹ In this review process recently and increasingly attention has been paid to climate change issues.

An extremely important contribution to this review process is provided by the Regular Process for Global Reporting and Assessment of the State of the Marine Environment, including Socioeconomic Aspects, established in 2002 by the UN General Assembly.¹² It took some years before this decision was actually implemented, but in 2015 the First Global Integrated Marine Assessment (also referred to as ‘World Ocean Assessment’), the result of the first cycle of ‘assessment of assessments’, was issued.¹³ The second cycle is scheduled for completion in 2020. This first Assessment provides a wealth of information about the state of the ocean and this report has made extensive use of it for the underlying factual information.

2. CAUSES OF CLIMATE CHANGE AND EFFECTS ON THE OCEAN

As far as the causes of climate change are concerned, it should be noted that global warming is a result of both natural and anthropogenic processes. The natural processes can be related to sudden events such as volcanic eruptions or solar irradiance variations, and to long-term geological processes (glacial/interglacial cycles). Also a mix of natural and anthropogenic causes is possible, for example emissions of methane gases from areas which were permanently frozen but are now surfacing periodically as a result of global warming.¹⁴

This paper will focus on the man-made causes which, according to the Intergovernmental Panel on Climate Change (IPCC), have already resulted in approximately 1 degree of warming since industrial times. The IPCC was established in 1988 by the World Meteorological Organization (WMO) and UNEP, with the task of providing internationally coordinated scientific assessments of the magnitude, timing and potential environmental and socio-economic impact of climate change.¹⁵

¹¹ See R.R. Churchill, *The 1982 United Nations Convention on the Law of the Sea*, in D.R. Rothwell, A.G. Oude Elferink, K.N. Scott and T. Stephens (eds.), *The Oxford Handbook of the Law of the Sea*, Oxford University Press 2015, pp. 24-45.

¹² UN GA Res. 57/141, paragraph 45, adopted on 12 December 2002.

¹³ The summary was issued as an official document of the UN General Assembly (A/70/112) on 22 July 2015.

¹⁴ IPCC, Fifth Assessment report.

¹⁵ On the IPCC see <<http://www.ipcc.ch/index.htm>>. The UN General Assembly endorsed the establishment of IPCC in UNGA Res.43/53, 6 December 1988.

The IPCC has so far issued five Assessment reports, the latest in 2014.¹⁶ On 6 October 2018 it issued a special report dealing with the impacts of global warming of 1.5°.¹⁷

Global warming is caused by the emission of greenhouse gases (GHG), mainly CO₂ (but also methane, nitrous oxide and ozone), overwhelmingly originating from human activities on land. However, emission of GHG is also caused by sea-based activities: mainly shipping, but also oil and gas extraction operations, and aircraft flying over the ocean.

As far as the *effects* on the ocean are concerned, three main ones can be identified: ocean warming, including the resulting sea level rise, ocean acidification, and ocean deoxygenation.

Ocean warming and sea level rise

The ocean has absorbed most of the extra heat caused by the greenhouse effect, resulting in approximately 1 degree warming already, with regional variations. The warmer ocean is changing ocean circulation patterns and also has an effect on weather patterns, in particular causing extreme events such as severe storms, extreme heat, flooding and droughts.

It also causes the melting of sea ice, in particular in the Arctic Ocean, which makes parts of the Arctic increasingly accessible for navigation, mineral resource exploitation and fishing. It is now possible during the summer season to navigate by ship from East Asia to Europe through the Northern Sea Route. Increasing possibilities for oil and gas extraction in Arctic areas, ironically, would ultimately result in more emission of GHG, thus exacerbating the problem of sea level rise. A warmer ocean will cause fish stocks to move towards colder areas, northwards and southwards, with resulting conservation and management issues. Another effect is coral bleaching, which may cause coral death.

The warming of sea water leads to its expansion, and in combination with more water due to the melting of sea ice and the ice caps of Greenland and Antarctica, and glaciers, results in sea level rise. Since the 19th century the sea level has risen approximately 0.3 meters (with regional variations). It is expected to rise this century with at least approximately 1 meter (with strong regional variations), but this could be much more depending on the melting of the Greenland and Antarctic ice sheets. Even if the emission of GHG is substantially reduced, the sea level will continue to rise in the coming centuries.¹⁸

A rising sea level will have the obvious effect of loss of land: the sea will move landward as a result of which dry land will become submerged or uninhabitable,

¹⁶ The fifth report is to be found at: <<http://www.ipcc.ch/report/ar5/syr/>>.

¹⁷ *Global Warming of 1.5°C, an IPCC special report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty.*

¹⁸ See report of the ILA Committee on International Law and Sea Level Rise.

and low-lying islands will disappear or become uninhabitable. The extent of loss of land will depend on the gradient of the coastal area: the smaller the gradient, the further the sea will progress landwards. In cases where there is a steep coastline, sea level rise will have little effect, but in many regions of the world vast coastal areas are almost at the current sea level, or even below in cases of coastlines constituted by sea walls or dunes. Thus, a small amount of sea level rise could result in the ocean progressing inwards over many kilometres of coastal land. The coast of Bangladesh is an example of where huge areas of land could become inundated. As far as islands are concerned, both populated and unpopulated, there are many which have a natural ground elevation of no more than one or two metres, in particular in the Pacific and Indian Oceans.

These land-inundating effects of sea level rise can be prevented or mitigated by reinforcing and increasing the coastal defences by engineering works. However, this is often not practicable due to the huge costs involved. Especially the States most affected generally have limited financial means. As a consequence, it can be expected that in many areas the population will have to move. People will have to leave low-lying islands, either by migration or by resettlement or even evacuation. Not only the countries affected, but also neighbouring countries will be confronted with difficult decisions to deal with this issue. Should in some circumstances such migrants be accorded a status as ‘climate refugees’? These issues raise important international law questions, but are outside the realm of the law of the sea and will therefore not be dealt with in this report. The ILA Committee on Sea Level Rise and International Law, which was established in 2012, has addressed these issues and recently completed its work on this part of its mandate by drafting a set of principles, with commentaries, which were adopted at the Sydney ILA Conference on 23 August 2018 as the ‘Sydney Declaration of Principles on the Protection of Persons Displaced in the Context of Sea Level Rise.’¹⁹

It is even possible that some island States will lose all habitable territory, with the result that there is no population left. And in extreme cases ultimately there may be even no territory left. This will call in question the continued existence of the State, raising the fundamental issue of the nature of Statehood. Although these questions are not regulated by the law of the sea, this report will briefly address them in Section 6. In Section 5, however, this report will address in some detail another consequence of sea level rise, namely potential loss of entitlement to maritime jurisdictional zones.

Ocean acidification

Acidification of the ocean is directly caused by the increase of carbon dioxide (CO₂) levels in the atmosphere. In the words of scientific experts:

¹⁹ <<http://www.ila-hq.org/index.php/resolutions-passed-at-the-ila-78th-biennial-conference>>.

When CO₂ enters the ocean it rapidly goes through a series of chemical reactions which increase the acidity of the surface sea water (lowering its pH). The ocean has already removed about 30% of anthropogenic CO₂ over the last 250 years, decreasing pH at a rate not seen for around 60 million years.

This effect can be considered beneficial since it has slowed the accumulation of CO₂ in the atmosphere and the rate of global warming; without this ocean sink atmospheric CO₂ levels would already be greater than 450 ppm. However, the continuation of such a fundamental and rapid change to ocean chemistry is likely to be bad news for life in the sea: it will not only cause problems for organisms with calcium carbonate skeletons or shells (such as oysters, mussels, corals and some planktonic species) but could also impact many other organisms, ecosystems and processes with potentially serious implications for society.

The average acidity of the upper ocean has already declined by around 0.1 pH unit (30% increase in acidity) since the industrial revolution and it is expected to further decline by about 0.3 pH units by the end of this century if CO₂ emissions continue at the current rate.²⁰

Ocean deoxygenation

Ocean deoxygenation is the reduction of dissolved oxygen (O₂) in seawater. Again, in the words of scientific experts:

Climate change can influence oxygen levels in the ocean in several ways. This is certain to occur in a warmer ocean since higher temperatures reduce oxygen solubility. Warming is also likely to create a more stratified ocean, decreasing the downward oxygen supply from the surface. Ocean acidification and nutrient run-off from streams and rivers can also contribute to deoxygenation.

Fish, sea-mammals and many other marine organisms depend on sufficient levels of oxygen to function, and may therefore be stressed by declining oxygen concentrations. Extended zones of low oxygen may result in the exclusion of such organisms. However, other organisms tolerant of low oxygen, particularly microbes, are likely to flourish, altering the balance of communities. Low oxygen levels in the ocean may also increase the amount of greenhouse gases in the atmosphere by changing feedback mechanisms involving methane and nitrous oxide.

Current ocean models predict declines of 1 to 7% in the global ocean oxygen inventory over the next century. However, there are considerable uncertainties regarding the scale and location of oxygen changes, and their ecological impacts.²¹

²⁰ C. Turley, T. Keizer, P. Williamson, J.-P. Gattuso, P. Ziveri, R. Monroe, K. Boot and M. Huelsenbeck, *Hot, sour and breathless – Ocean under stress*. Plymouth Marine Laboratory, UK Ocean Acidification Research Programme, European Project on Ocean Acidification, Mediterranean Sea Acidification in a Changing Climate project, Scripps Institution of Oceanography at UC San Diego, OCEANA; 2013 6 pp.

²¹ Ibid.

Finally, it is important to realize that, in addition to the effects mentioned above, and their interaction, the ocean for many decades has been suffering from other stressors, in particular pollution, mainly from land-based sources, marine litter and overfishing. To these are now increasingly added the new stressors resulting from climate change. It is therefore apt to refer to the ocean as ‘an ocean under stress.’

3. WHAT CAN BE DONE? PREVENTION, MITIGATION AND ADAPTATION MEASURES RELATING TO THE OCEAN

Prevention and mitigation

Real *prevention* of global warming from anthropogenic sources is no longer possible. As a result of the emission of greenhouse gases since the industrial revolution the average temperature of the atmosphere has already risen by 1 degree, and will continue to rise. How much will depend on the efforts to curb the emission of GHG. The most recent IPCC report indicates that limiting the rise to 1,5 degree might be possible, but will require huge efforts. Without such efforts, a rise of 2, 3 or even 4 degrees could occur in the coming centuries, with potentially devastating effects.

Thus, what still can be done to prevent further rising of the temperature is more of the nature of *mitigation*: first and foremost, decreasing the emission of greenhouse gases. These mainly originate from land-based activities. In order to decrease emissions, less use of fossil fuel must be made, which involves a transition to other sources of energy. Wind energy is one, and the ocean provides a source of space for harvesting wind energy by building windmill parks, which is already being done on a large scale. Other sources of ‘clean’ energy that may be provided by the ocean involve the production of energy from currents and tides.

However, greenhouse gases are also emitted by sea-based activities, in particular shipping. Current estimates are that international shipping accounts for 2.2% of global anthropogenic carbon dioxide emissions, and that this could increase significantly in the coming decades. Even if far-reaching measures are taken it is highly unlikely that this percentage will shrink soon.²² Other sea-based activities emitting significant amounts of GHG are offshore oil and gas production and aircraft flying over the ocean.

Apart from using the ocean for providing alternative, ‘clean’ sources of energy, it is also possible to use it for ‘negative emissions’, i.e. sequestering carbon dioxide. This is another example of the ocean offering a contribution to solutions helping to mitigate global warming, both by offering space and by its own physical composition. A distinction can be made between methods to sequester carbon dioxide below the seabed, and storage in the water column or on the seabed. Sub-seabed storage in geological formations of carbon dioxide can be executed by

²² Third IMO GHG Study 2014.

means of pipes transporting the carbon dioxide from collectors located on land or located on installations at sea.²³

Methods for storing carbon dioxide in the water column or on the seabed come within the scope of the notion of ‘geoengineering’, i.e. the deliberate large-scale intervention in the Earth’s natural systems to counteract climate change. When such intervention is conducted in the ocean it can be referred to as ‘marine geoengineering.’ Various methods have been proposed, but their effectivity is still under examination. There are also concerns about possible deleterious effects they may have on the marine environment. In addition to sequestering carbon dioxide, these methods may be useful for other purposes as well, such as enhancing fish production. Among the methods being suggested are artificial upwelling, enhancing ocean alkalinity, deposition of crop wastes on the deep seabed, mineralization of rocks in the seabed, and ocean iron fertilization (OIF).²⁴

OIF has attracted most attention because of a number of experiments that have been carried out, also by commercial companies in view of its possible use for trading carbon credits. OIF involves the introduction from a ship into the water column of iron particles. These will cause the growth of phytoplankton, which captures CO₂, in the warmer surface layer. The dead plankton will sink, below the thermocline layer, to the colder, deeper layer, reaching depths where carbon may stay for 100 years or more. The idea is that plankton populations will rebound to historic levels, reviving fisheries and sequestering vast amounts of carbon. The fear, however, is that this process will lead to the depletion of deep-water oxygen, alters the food chain, and will promote toxic species, and that the CO₂ will soon resurface.²⁵

Adaptation

In the sphere of adaptation, most measures to be considered are of an administrative and policy nature rather than technical, with the exception of the engineering works for enhancing coastal defences against sea level rise, and other water management works. Administrative measures already mentioned above are resettlement of coastal populations. Sea level rise also will need a response from international law, as will be further explored below in Section 5.

Other areas of adaptation will require measures of an administrative and policy nature to deal with such issues as fisheries management and dealing with shipping safety in polar areas where receding ice cover is making navigation possible but significant hazards and pollution risks will exist.

²³ <<https://www.ospar.org/work-areas/oic/carbon-capture-and-storage>>.

²⁴ <<https://www.cbd.int/climate/geoengineering/>>.

²⁵ <<http://moocs.southampton.ac.uk/oceans/2014/11/22/ocean-fertilization-a-viable-geoengineering-option-or-a-pipe-dream/>>.

4. LEGAL RESPONSES: MITIGATION OF CAUSES AND ADAPTATION TO EFFECTS OF CLIMATE CHANGE INVOLVING THE LAW OF THE SEA

4.1 Introduction

In this section dealing with the legal responses to climate change affecting the ocean, inevitably a selection had to be made since there is a vast range of issues that could be addressed. The main criterion applied is their relevance for illustrating how the law of the sea, both the general and the particular, is dealing with these issues, both in the spheres of mitigation and of adaptation.

As far as the general law of the sea is concerned, the main topic selected in the sphere of *adaptation* is sea level change, to be discussed separately and fully in Section 5 below. In the sphere of *mitigation*, three topics will be dealt with, i.e. regulation of GHG emissions from ships and the regulation of the use of the ocean environment to capture GHG, in particular CO₂: sub-seabed sequestration and marine geoengineering. These three topics will also be dealt with as examples of the application of the particular law of the sea to climate change *mitigation* issues, while only one example from the sphere of *adaptation* can be discussed (on fisheries in the Arctic) because of lack of space.

In this section at some points the jurisdictional framework of the law of the sea will be referred to, although that framework will only be set out later in Section 5.2; the reader is thus referred to that section.

4.2 Mitigation issues: general international legal framework

Before dealing with the more specific conventional legal regimes created by States relevant to climate change affecting the ocean it is necessary to briefly describe the general international legal framework. In this context the ongoing work of the International Law Commission (ILC) on Protection of the Atmosphere provides a useful starting point. The ILC commenced its work on this topic in 2013, and in 2018 the Commission's Drafting Committee adopted the text of a set of Guidelines on first reading.²⁶ These draft Guidelines can be seen as a compilation of norms reflecting to a large extent customary international law.

Draft Guideline 3 states that

States have the obligation to protect the atmosphere by exercising due diligence in taking appropriate measures, in accordance with applicable rules of international

²⁶ UN Doc. A/CN.4/L.909, 6 June 2018.

law, to prevent, reduce or control atmospheric pollution²⁷ and atmospheric degradation.²⁸

Draft Guideline 4 confirms that

States have the obligation to ensure that environmental impact assessment is undertaken of proposed activities under their jurisdiction or control which are likely to cause significant adverse impact on the atmosphere in terms of atmospheric pollution or degradation.

Draft Guidelines 5 and 6 state that utilization of the atmosphere, as a natural resource with a limited capacity, must be undertaken in a sustainable, equitable and reasonable manner. Draft Guideline 7 states that

[a]ctivities aimed at intentional large-scale modification of the atmosphere [geoengineering] should be conducted with prudence and caution, subject to any applicable rules of international law.

Draft Guideline 9 points at the need to harmonize the rules of international law in various fields (including the law of the sea), resulting in compatible obligations with a view to avoiding conflicts, and to give special consideration to particularly vulnerable groups, such as people of low-lying coastal areas and small island developing States affected by sea-level rise.

In addition to customary international law rules of sustainable development, precaution and environmental impact assessment mentioned in these guidelines, other customary international law rules and principles provide further guidance and complement treaty obligations, such as the obligation to prevent transboundary harm.

As far as the law of the sea is concerned, the relevant international legal framework is provided by first of all Part XII of the LOSC, which contains a comprehensive set of provisions for the protection and preservation of the marine environment. It starts in Art. 192 with stating that “States have the obligation to protect and preserve the marine environment.”

Art. 194 then requires States to take all measures necessary to prevent, reduce and control pollution of the marine environment from any source, and provides further details for implementing this obligation. Pollution is broadly defined in Art. 1(1)(4) of the Convention as “the introduction by man, directly or indirectly, of

²⁷ Atmospheric pollution is defined in draft Guideline 1(b) as “the introduction or release by humans, directly or indirectly, into the atmosphere of substances contributing to deleterious effects extending beyond the State of origin of such a nature as to endanger human life and health and the Earth’s natural environment.”

²⁸ Atmospheric degradation is defined in draft Guideline 1(c) as “the alteration by humans, directly or indirectly, of atmospheric conditions having significant deleterious effects of such a nature as to endanger human life and health and the Earth’s natural environment.”

substances or energy into the marine environment...”²⁹, and would thus include the emission of GHGs resulting in ocean warming. Art. 212 contains an obligation for States to “adopt laws and regulations to prevent, reduce and control pollution of the marine environment from or through the atmosphere” and to apply them, *inter alia*, to vessels flying their flag and aircraft of their registry, as well as an exhortation to States, acting especially through competent international organizations or diplomatic conference, “to establish global and regional rules, standards and recommended practices and procedures to prevent, reduce and control such pollution.”

As a consequence, for States parties to the Convention there exists a due diligence obligation to control and reduce emissions of GHGs. Since this obligation essentially aims to prevent transboundary pollution it can be regarded as a specific application of the general principle of customary international law that States are under a duty to prevent transboundary harm, and harm to the global commons, and thus also applies to non-parties to the LOSC.

The obligations of Art. 212 apply to both land-based activities and sea-based activities such as shipping, air transportation and offshore oil and gas production.³⁰ As far as land-based activities are concerned one could regard the climate change regime under the UN Framework Convention on Climate Change³¹ as the forum chosen by the world community to implement the exhortation of Art. 212 LOSC to establish global rules and standards for the control and reduction of emissions of GHGs. Initially, the 1997 Kyoto Protocol³² was intended to provide for this through a system of specific obligations for groups of States for the reduction of the emission of GHG. However, another approach has now been adopted in the Paris Agreement, which requires the adoption by the parties of Nationally Determined Contributions, to achieve the objectives of the Agreement of holding the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°.³³ This regime will not be further dealt with in this report. It is important to note that the Paris Agreement does not directly include emissions from ships and aircraft, but left the adoption of rules and standards for these activities to the competent international

²⁹ Art. 1(1)(4) reads: “pollution of the marine environment” means the introduction by man, directly or indirectly, of substances or energy into the marine environment, including estuaries, which results or is likely to result in such deleterious effects as harm to living resources and marine life, hazards to human health, hindrance to marine activities, including fishing and other legitimate uses of the sea, impairment of quality for use of sea water and reduction of amenities.

³⁰ Art. 207 LOSC deals with pollution from land-based sources.

³¹ Adopted 9 May 1992; entered into force 21 March 1994.

³² Adopted on 11 December 1997; entered into force 16 February 2005.

³³ Adopted 12 December 2015; entered into force on 4 November 2016. For links to the text, see E. Hey and F. Violi, “The Hard Work of Regime Interaction: Climate Change and Human Rights”, n. 1, *supra* p. 5 and J. Spier, “Private Law as a Crowbar for Coming to Grips with Climate Change”, n. 21, *supra* p. 34.

organizations, i.e. the IMO for shipping and the International Civil Aviation Organization (ICAO) for aircraft.

But there is a link again with the law of the sea because of the various ways States can implement their obligations to reduce the emission of GHGs. One of such ways is the use of the ocean as an alternative source of (clean) energy. The production of energy from wind, tides and currents involves the placing of installations and structures, as well as cables, in the ocean. These activities are governed by provisions of the LOSC, but these will not be dealt with here.

This brings us back to the LOSC since the Convention also includes specific obligations for standard setting with respect to various sea-based activities. Art. 208 deals with pollution from seabed activities subject to national jurisdiction. This includes offshore oil and gas production activities. Coastal States must adopt national legislation to prevent and control such pollution resulting from seabed activities in their territorial sea and EEZ. Such rules must be no less effective than international rules and standards, to be established. So far no such international global rules have been established, nor at the regional level, so that the regulation of this activity is left to the national legislation of the coastal State in question. Although these emissions are covered by the Paris Agreement, this seems currently a *lacuna* in international standards at the global level.

As far as shipping is concerned, Art. 211 LOSC obliges States, acting through the competent international organization or general diplomatic conference, to establish international rules and standards to prevent and control marine pollution from vessels. All flag States must adopt and enforce national legislation for this purpose which must have at least the same effect as that of generally accepted international rules and standards. Such rules and standards may also be applied by coastal States to foreign-flag vessels in their territorial sea and EEZ. The competent international organization for this purpose is the IMO. The IMO implements this task through the 1973 International Convention for the Prevention of Pollution from Ships, as modified by the Protocol of 1978 (MARPOL Convention).³⁴ This will now be further explored.

4.3 Regulation of emissions from shipping

The emission of GHG by international shipping was taken up by the IMO and resulted in the adoption of Annex VI to the MARPOL Convention in 1997, which entered into force in 2005.³⁵ It limits the main air pollutants contained in ships exhaust gas, including sulphur oxides (SO_x) and nitrous oxides (NO_x), and prohibits deliberate emissions of ozone depleting substances (ODS). MARPOL Annex

³⁴ 1340 UNTS 62; entered into force on 2 October 1983.

³⁵ Art. 16(5) MARPOL provides that the adoption and entry into force of a new Annex is subject to the same procedures as for the adoption and entry into force of an amendment to an Article of the Convention.

VI also regulates shipboard incineration, and the emissions of volatile organic compounds (VOC) from tankers.

Following the entry into force of MARPOL Annex VI, the Marine Environment Protection Committee (MEPC), at its 53rd session (July 2005), agreed to revise MARPOL Annex VI with the aim of significantly strengthening the emission limits in light of technological improvements and implementation experience. As a result of three years examination, MEPC 58 (October 2008) adopted the revised MARPOL Annex VI and the associated NO_x Technical Code 2008, which entered into force on 1 July 2010.

On 13 April 2018 the MEPC adopted the ‘Initial IMO Strategy on Reduction of GHG Emissions from Ships’,³⁶ setting out the levels of ambition and guiding principles for this purpose and as contribution to achieving the goals of the Paris Agreement. The ‘carbon intensity’ of international shipping is to decline, by reducing CO₂ emissions per transport work, as an average across international shipping, by at least 40% by 2030, pursuing efforts towards 70% by 2050, compared to 2008, and GHG emissions from international shipping are to peak as soon as possible and the total annual of GHG emissions should be reduced by at least 50% by 2050 compared to 2008.

Reduction of emission of GHG by ships has thus become the subject of detailed regulation under the auspices of IMO. The legal means to arrive at binding measures was to add a new Annex to an already existing convention, namely the MARPOL Convention. Although one may take the view that this process is going too slow, there is one positive feature to be mentioned and that is the effect of the rules of reference included in the LOSC, in this case in Art. 211 (in combination with Artt. 217, 218 and 220 dealing with enforcement jurisdiction). This provision obliges flag States to adopt and enforce ‘generally accepted international rules and standards’ to prevent vessel-source pollution. It is submitted that the annexes of the MARPOL Convention that have entered into force (which requires a high threshold of participating States and world tonnage) may be considered as ‘generally accepted’, and thus must also be applied by States that are not a party to the MARPOL Convention or have not accepted Annex VI. This means that the requirements of Annex VI must be complied with by all States parties to the LOSC. This is a highly effective means of global law-making in a technical field.

4.4 Sub-seabed CO₂ sequestration

When the option of storing carbon dioxide in geological formations under the seabed started to be considered there were uncertainties about the legal regime that would be applicable. The conventional framework that appeared most closely related to these issues was the ‘dumping’ regime, both at the global and at the regional level.

³⁶ IMO Doc. MEPC 72/17/Add.1.

Dumping essentially involves the deliberate disposal of wastes or other matter from vessels, aircraft or structures at sea. The LOSC regulates dumping in Art. 210. Dumping may only be carried out with permission from the authorities of a State. Any dumping in the territorial sea or EEZ, or on the continental shelf, needs the express prior approval of the coastal State. The article exhorts States to establish global and regional rules, standards and recommended practices and procedures to prevent, reduce and control pollution from dumping. National rules must be at least as effective as the established global rules. Art. 216 assigns the task of enforcing the (global) rules, in addition to the coastal State, to the flag State and to the port State of loading materials to be dumped.

At the global level, the 1972 London Convention³⁷ (LC) and the 1996 London Protocol³⁸ (LP) establish the rules and standards mentioned in Art. 210 LOSC. Their aim is to prevent pollution of the ocean by the dumping of materials that could endanger human health or harm the marine environment. Art. III(1)(a) of the London Convention defines dumping as “any deliberate disposal at sea of waste or other matter from vessels, aircraft, platforms or man-made structures at sea.” Dumping of certain listed materials is wholly prohibited, while dumping of other substances is only allowed subject to requirements such as prior environmental impact assessment and ongoing monitoring as set out in Annex III of the Convention. The London Protocol, which is intended to replace the LC, strictly prohibits the dumping of any waste or other matter except for those materials specifically listed in Annex I. Such dumping is subject to rigorous risk assessment and control and scientifically based procedures for disposal.

The London Convention does not refer to the seabed or sub-seabed, and thus it was concluded that subsea carbon storage was not covered by its regime. However, when the London Protocol was negotiated the definition of dumping was expanded to cover storage of waste or other matter in the sea-bed and subsoil. This meant, in combination with the new system of the Protocol that only substances listed in Annex 1 may be ‘dumped’ and carbon dioxide was not included, that subsea carbon storage would be prohibited. But it could also be regarded as falling under the exception from the definition of dumping of “placement for a purpose other than the mere disposal thereof” and thus permitted. This created uncertainty as to the applicable legal regime for sub-seabed carbon sequestration.

Because of growing interest in carbon dioxide capture and storage in sub-seabed geological formations, and in light of several studies carried out under the auspices of the LC and also the Convention on Biological Diversity (CBD),³⁹ the First Meeting of Contracting Parties to the LP, immediately after its entry into force in

³⁷ Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, adopted 29 December 1972, entered into force 30 August 1975, 1046 UNTS 120.

³⁸ Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, adopted 8 November 1996, entered into force 24 March 2016, (1997) 36 ILM 1.

³⁹ Convention on Biological Diversity, adopted on 22 May 1992, entered into force on 29 December 1993. 1760 UNTS 79

2006, decided to explicitly confirm the applicability of the Protocol to this activity and adopted an amendment to Annex 1 to the Protocol to permit and regulate it. By adding ‘Carbon dioxide streams from carbon dioxide capture processes for sequestration’ in the list of wastes or other matter that may be considered for dumping (new section 1.8), and stipulating that these carbon dioxide streams may only be considered for dumping if disposal is into a sub-seabed geological formation (as well as some other conditions; new section 4) it was ensured that sub-seabed storage will be regulated.⁴⁰ Since the LP has provisions which allow quick entry into force of amendments to the Annex (100 days after the date of their adoption, except for any party which declares not to accept the amendment),⁴¹ these new rules entered into force on 10 February 2007 (for all parties, no party having made a declaration). In 2009 a consequential amendment to the LP itself (Art. 6) was adopted to ensure that the export of carbon dioxide streams for disposal in accordance with Annex 1 was allowed, subject to certain conditions.⁴² Amendments to the Protocol enter into force after two-thirds of the parties have formally accepted them, and only for those parties.⁴³ It will probably take many years before this will be achieved for this amendment.

In 2012 the parties to the London Convention and the London Protocol adopted detailed Specific Guidelines for the Assessment of Carbon Dioxide Streams for Disposal into Sub-Seabed Geological Formations.⁴⁴

Meanwhile, similar discussions had taken place at the regional level: the Commission of the OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention),⁴⁵ which also regulates dumping, had discussed the issue of the placement of carbon dioxide in the OSPAR maritime area over a number of years. In 2006 the OSPAR Commission discussed a report on ocean acidification,⁴⁶ and concluded that from among various methods for carbon sequestration the sub-seabed storage method should be regulated under the Convention’s regime. As a result, in 2007 amendments to Annexes II and III of the Convention were adopted. In Art. 3 of Annex II, carbon dioxide streams from carbon dioxide capture processes for storage were included in the list of matter that may be dumped, provided the disposal is into a sub-soil geological formation. A similar provision was included in Art. 3 of Annex III dealing with dumping from

⁴⁰ Resolution LP.1(1) on the amendment to include CO₂ sequestration in sub-seabed geological formations in Annex 1 to the London Protocol, adopted on 2 November 2006. The amendment entered into force on 10 February 2007.

⁴¹ Art. 22(4) LP.

⁴² Resolution LP.3(4) on the amendment of Article 6 of the London Protocol, adopted on 30 October 2009. The amendment has not yet entered into force.

⁴³ Art. 21 LP.

⁴⁴ IMO Doc. LC 34/15, Annex 8 (2 November 2012).

⁴⁵ Adopted on 22 September 1992; entered into force 25 March 1998.

⁴⁶ <https://www.researchgate.net/publication/273699654_ICES_2014_Final_report_to OSPAR_of_the_Joint OSPARICES_Ocean_Acidification_Study_Group_SGOA_ICES_CM_2014ACOM67_141_pp>.

offshore installations. These amendments entered into force on 23 July 2011 for the parties that had accepted them.⁴⁷

In conclusion, both at the global (LP) and the regional (OSPAR) level, States have acted relatively quickly to provide a legal regime for sub-sea carbon dioxide sequestration, in anticipation of an actual practice (and in the light of the main concern that exists with respect to this method, that is to say leaks of carbon). This reflects the use of precaution, which is mandated by the LP (Art. 3(1)), and the OSPAR Convention (Art. 2(20(a))). What is even more interesting, however, is again the effect of the rules of reference in the LOSC. Art. 210 (in combination with Art. 216 on enforcement jurisdiction) obliges the parties to the LOSC to adopt national legislation on dumping that is no less effective than the global rules and standards. It is submitted that these global rules are the ones included in the LP, once they have entered into force. Thus, the detailed technical rules of the LP mentioned above may be considered to be applicable to the activities by all States party to the LOSC.

4.5 Marine geoengineering

A similar question concerning the applicable international legal regime as in the case of sub-seabed storage of carbon dioxide arose with respect to methods of sequestration in the water column or on the seabed (marine geoengineering). The method attracting most attention was Ocean Iron Fertilization (OIF) after the first scientific experiments had taken place in the 1990s and early 2000s. Two intergovernmental fora considered themselves competent to discuss these issues: the LC/LP Contracting Parties and the Conference of the Parties (COP) to the Convention on Biological Diversity. The mandates and regulatory systems of these two fora are quite different. Whereas the LC/LP concern dumping at sea and contain prohibitions of activities with a system of permits, the CBD is of a different kind: it contains obligations for States to take active measures for the conservation of biodiversity (both on land and at sea). From this mandate the CBD has a general interest in geoengineering. It issued several reports in this area, which included marine issues.⁴⁸

In 2007 the Scientific Groups of LC/LP adopted a ‘Statement of Concern Regarding Iron Fertilization of the Ocean to Sequester CO₂,’⁴⁹ indicating that ocean iron fertilization may cause significant risks of harm to the marine environment. The parties to the LC and the LP decided to study the issue with a view to regulating the activity. Pending such regulation they called for careful consideration by

⁴⁷ Art. 17 jo. Art. 15 OSPAR Convention provides that amendments to Annexes enter into force when at least seven contracting parties have formally accepted them.

⁴⁸ A detailed review of the work of CBD and LC/LP on the regulation of marine geoengineering is provided in B. Boschen, *The Regulation of Ocean Fertilization and Marine Geoengineering under the London Protocol*, in R.S. Abate (ed.), *Climate Change Impacts on Ocean and Coastal Law*, Oxford University Press 2015.

⁴⁹ Doc. LC-LP.1/Circ.14, 13 July 2007

States of any proposals for experiments. The question whether OIF was subject to the regime of the LC/LP was complicated, because on the one hand it could be argued that the activity was not covered by the definition of dumping since it involved the placement of matter into the sea for a purpose other than the mere disposal thereof, while on the other hand it was argued that it involved placement contrary to the aims of the Convention and Protocol (the wording of the identical exemptions from the definition of dumping in LC (Art. III(1)(b)(ii)) and LP (Art. 1(4)(b)(ii)).

In the meantime also the Conference of the Parties to the CBD had examined the issue and in 2008 adopted a decision urging all States parties to ensure that ocean iron fertilization activities do not take place, with the exception of small-scale scientific research within national jurisdiction, until the scientific and regulatory bases are in place to ensure its effective regulation.

In 2008 the Meetings of the parties to the LC/LP adopted a non-binding resolution stating that ocean fertilization activities other than legitimate scientific research should not be allowed.⁵⁰ Such activities should be considered as contrary to the aims of the Convention and Protocol.

In October 2013 Meetings of the parties to the London Convention and the London Protocol adopted resolution LP.4(8) on the amendment to the London Protocol to Regulate Placement of Matter for Ocean Fertilization and Other Marine Geoengineering Activities. The amendment consisted of four elements. Firstly, the addition of a new definition in Art. 1 (5bis) of ‘marine geoengineering’, as follows:

the deliberate intervention in the marine environment to manipulate natural processes, including to counteract anthropogenic climate change and/or its impacts, and that has the potential to result in deleterious effects, especially where those effects may be widespread, long-lasting or severe.

Secondly, a new Art. 6bis on ‘Marine geoengineering activities’ was added, providing that such activities involving placement of matter into the sea listed in Annex 4 are prohibited unless they are carried out with a permit. Thirdly, a new Annex 4 is added listing the marine geoengineering activities covered by the regime of Art. 6bis. Only OIF is currently listed, and only OIF activity assessed as legitimate scientific research is permissible. Fourthly, a new Annex 5 was added, containing a generic Assessment Framework for Matter that may be Considered for Placement under Annex 4. Thus, under the LP regime, when the amendments have entered into force, only ‘legitimate scientific research’ projects concerning OIF may take place with a prior permit and under strict requirements. In the future other activities may be brought within the scope of Annex 4.

The approach towards marine geoengineering activities (involving placing matter into the sea) under the LP, again, is clearly an example of the application of the precautionary approach, mandated by its Art. 3(1). The conclusions reached at the

⁵⁰ Res. LC-LP.1 on the Regulation of Ocean Fertilization, adopted on 31 October 2008, IMO Doc. LC 30/16, Annex 6.

end of the previous sub-section, on the effect of the rules of reference in the LOSC, apply here as well: the regulation of marine geoengineering in the LP is also binding on the parties to the LOSC that are not party to the LP.

Adaptation issues

4.6 **Living resources and biodiversity**

Many effects of climate change on the ocean that require adaptation measures involving the law of the sea can be identified. For example, the effects on marine biodiversity in both areas under national jurisdiction and areas beyond national jurisdiction, or the increased accessibility of polar sea areas for navigational purposes or for fishing. Changes in productivity levels and changes in species distribution caused by a warming ocean will have implications for the management of fish stocks under international fisheries law. Such management is often done by Regional Fisheries Management Organizations (RFMOs), although still not all parts of the ocean are subject to management by an RFMO. As a result of migrating fish stocks, the geographical areas of management may have to be readjusted, or particular conservation measures adapted. Only one specific example can be given in this report.

This highly interesting case in point concerns the Arctic Ocean, which covers a large area beyond the limits of the EEZs of the five coastal States (Norway, Denmark in respect of Greenland, Canada, the USA and the Russian Federation). This area until recently was completely frozen during all parts of the year, but now during summer increasing parts have become open waters. This means that in the future these areas will become available for (commercial) fishing. However, the five Arctic States, together with four other interested States (Iceland, China, Japan and South Korea) and the European Union (competent in the matter of fishing for all its member States), have over the past few years negotiated an agreement that will prevent commercial fisheries from starting in the Central Arctic Ocean before adequate scientific information is collected and appropriate regulatory mechanisms are in place. The ten parties to this new agreement have agreed to close the region to fishing for at least sixteen years to better understand this ever changing ecosystem and its marine life and to determine if fishing there could be ecologically sustainable. After that initial term, the agreement will extend automatically in five-year increments unless a party objects or science-based fishing limits and management measures are adopted. The Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean (Arctic Fisheries Agreement)⁵¹ was opened for signature on 3 October 2018 and will enter into force after all nine States and the EU have ratified it.⁵²

⁵¹ Text in Annex to the Proposal for a Council Decision on the signing, on behalf of the European Union, of the Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean, COM(2018) 454 final, 12 June 2018.

⁵² Art. 11 of the Arctic Fisheries Agreement.

The Preamble of the Agreement expressly refers to the precautionary approach as underlying rationale for preventing the start of unregulated fishing in this area of the high seas. An interesting question here is the enforceability of the Agreement's prohibitions against fishing vessels from non-party States, which under the general law of treaties are of course not bound by it. First of all, the Agreement provides for the possibility of other States becoming a party (Art. 10(2)). Secondly, it can be expected that the parties will be able to dissuade vessels from non-parties from engaging in fishing. But also the Fish Stocks Agreement (FSA) is relevant here: if the Arctic Fisheries Agreement can be regarded as an RFMO, under Art. 17 and 21 of the FSA the parties may enforce their management measures also against vessels from FSA State parties who are not parties to the Arctic Fisheries Agreement.

5. ADAPTATION TO SEA LEVEL RISE: ENTITLEMENTS TO MARITIME ZONES⁵³

5.1 Introduction

As mentioned above, apart from the obvious loss of land there is another consequence of the rising sea level, namely potential loss of entitlement to maritime jurisdictional zones. States bordering the ocean (both continental and island States⁵⁴) have entitlements to jurisdiction over maritime spaces extending from their coasts up to certain distances. These distances are measured from the so-called 'baseline', a notion that will first be explained, in sub-section 5.2. Sub-section 5.3 will briefly summarize the regime of the various maritime jurisdictional zones and their importance for coastal States. Changes to the baseline as a result of sea level rise will have effects on the location and extent of these maritime zones as will be explained in sub-section 5.4, in situations where no agreements with neighbouring States are present. Sub-section 5.5 discusses these effects in situations where boundaries have been agreed by the neighbouring States. Sub-section 5.6 will highlight

⁵³ This section is partly based on my inaugural lecture at Utrecht University on 13 April 1989, *Zeegrenzen en zeespiegelstijging. Volkenrechtelijke beschouwingen over de effecten van het stijgen van de zeespiegel op grenzen in zee*. Kluwer, Deventer 1989. An English version under the title "The effects of a rising sea level on maritime limits and boundaries" was published in the *Netherlands International Law Review* 1990, pp. 207-232. The other early writings on this topic are: E.C.F. Bird and J.R.V. Prescott, 'Rising Global Sea Levels and National Maritime Claims', *Marine Policy Reports*, 1 (1989), pp. 177-196; D.D. Caron, 'When Law Makes Climate Change Worse: Rethinking the Law of Baselines in Light of Rising Sea Level', *Ecology Law Quarterly*, 17 (1990), pp. 621-653. D. Freestone, 'International Law and Sea Level Rise' in: R.R. Churchill and D. Freestone (eds.), *International Law and Global Climate Change* (London/Dordrecht: Graham and Trotman/Martinus Nijhoff, 1991), pp. 109-122. D. Freestone and J. Pethick, 'Sea Level Rise and Maritime Boundaries: International Implications of Impacts and Responses', in: G. Blake (ed.) *International Boundaries: Fresh Perspectives*, Vol. 5 (Routledge, 1994), pp. 73-90.

⁵⁴ Art. 121(2) LOSC.

the interests involved for both the coastal States and other States in these possible changes of the location and extent of maritime jurisdictional zones. Sub-section 5.7 will address the options for coastal States in preventing this loss of jurisdictional areas and the role of international law for this purpose. In sub-section 5.8 recent (regional) State practice in the Pacific will be reviewed, demonstrating that these issues are actually being addressed proactively in this region. Finally, in sub-section 5.9 future developments are addressed.

5.2 The baseline

The normal baseline is constituted by the low-water line along the coast.⁵⁵ The reference to the coast here includes the coast of any islands.⁵⁶ An island is defined in Art. 121(1) LOSC as “a naturally formed area of land, surrounded by water, which is above water at high tide.” This means that even the tiniest of high-tide features generates a baseline. The low-water line is defined as “the line along the coast marked on large-scale charts officially recognized by the coastal State.”⁵⁷ The exact determination of a low-water line by hydrographers requires the adoption of a low-water (vertical) datum, which is not specified in the LOSC, and for which there are several options. In practice the lowest astronomical tide (LAT) datum, or a datum close to LAT, is mostly used.⁵⁸ Even the low-water line of a ‘low-tide elevation’ may be used as a baseline for determining the outer limits of maritime zones, but only if the low-tide elevation is situated wholly or partly within twelve nautical miles from the baseline of the mainland or an island.⁵⁹ In the case of islands situated on atolls or of islands having fringing reefs, the baseline is constituted by the seaward low-water line of the reef, as shown by the appropriate symbol on charts officially recognized by the coastal State.⁶⁰

In certain, exceptional, situations a coastal State is entitled to employ, instead of the physical feature of the low-water line, another line as the baseline. In those cases the line is referred to as a *straight baseline*, since it involves imaginary lines connecting appropriate fixed geographical points along the coast. This method of straight baselines may be employed by the coastal State in localities where the coastline is deeply indented and cut into, or if there is a fringe of islands along the coast in its immediate vicinity.⁶¹ The drawing of straight baselines must not depart to any appreciable extent from the general direction of the coast, and the sea areas lying within the lines must be closely linked to the land domain. Straight baselines may not be drawn to and from low-tide elevations, unless lighthouses or similar

⁵⁵ Art. 5 LOSC.

⁵⁶ Art. 121(2) LOSC.

⁵⁷ Art. 5 LOSC.

⁵⁸ K. Trümpler, in A. Proelß (ed.), *United Nations Convention on the Law of the Sea. A Commentary*, C.H. Beck 2017, pp. 48-51.

⁵⁹ Art 13 LOSC, which defines a low-tide elevation as “a naturally formed area of land which is surrounded by and above water at low tide but submerged at high tide.”

⁶⁰ Art. 6 LOSC.

⁶¹ Art. 7(1) LOSC.

installations which are permanently above sea level have been built on them or except in instances where the drawing of baselines to and from such elevations has received general international recognition. In determining particular straight baselines the coastal State may take account of economic interests peculiar to the region concerned, the reality and the importance of which are clearly evidenced by long usage.⁶²

Another situation in which straight baselines may be drawn involves a coastline which is highly unstable, because of the presence of a delta and other natural conditions. In such a case the appropriate points may be selected along the furthest seaward extent of the low-water line and, notwithstanding subsequent regression of the low-water line, the straight baseline remains effective until changed by the coastal State.⁶³ Straight lines may furthermore be drawn across the mouths of rivers which flow directly into the sea,⁶⁴ and, provided certain conditions are met, between the natural entrance points of a bay when the distance between those points does not exceed 24 nautical miles.⁶⁵

Finally, there is one other situation in which straight baselines may be drawn, and which is of great relevance for the issue under consideration, namely that of mid-ocean archipelagos. An archipelagic State (i.e. a State constituted wholly by one or more archipelagos)⁶⁶ may draw “archipelagic baselines” joining the outermost points of the outermost islands and drying reefs of the archipelago, provided that within such baselines are included the main islands and an area in which the ratio of the water to the area of the land (including atolls) is between 1 to 1 and 9 to 1. The length of such baselines may, apart from a few exceptions, not exceed 100 nautical miles.⁶⁷

5.3 Maritime jurisdictional zones

The areas in which coastal States are entitled to exercise governmental authority (jurisdiction) can be divided into two categories. The first category includes sea areas under the sovereignty of coastal States. These are the maritime internal waters, the archipelagic waters and the territorial sea. The second category includes the sea areas in which coastal States exercise limited, functional jurisdiction. These are the contiguous zone, the exclusive economic zone (EEZ) and the continental shelf.

⁶² Art. 7(3)-(5) LOSC.

⁶³ Art. 7(2) LOSC.

⁶⁴ Art. 9 LOSC.

⁶⁵ Art. 10 LOSC.

⁶⁶ Art. 46 LOSC defines an archipelago as “a group of islands, including parts of islands, inter-connecting waters and other natural features which are so closely interrelated that such islands, waters and other natural features form an intrinsic geographical, economic and political entity, or which historically have been regarded as such.”

⁶⁷ Art. 47 LOSC.

The *maritime internal waters* include the waters landward of the baseline which have an open connection with the ocean.⁶⁸ These waters fall under the territorial sovereignty of the coastal State, in the same way as its land territory.⁶⁹

The *archipelagic waters* constitute the waters enclosed by the archipelagic baselines, mentioned above. These areas equally fall under the sovereignty of the coastal State (the ‘archipelagic State’),⁷⁰ with the proviso, however, that this State must respect a number of rights of other States, in particular the right of innocent passage for foreign ships, and a right of ‘archipelagic sea lanes passage’ in specific parts of the archipelagic waters for foreign ships and aircraft.⁷¹ This right of archipelagic sea lanes passage significantly limits the archipelagic States’ jurisdiction over foreign ship using the sea lanes, and allows submarines to navigate subsurface. Currently, about 20 States have claimed archipelagic State status.⁷² Examples of archipelagic States include Indonesia, the Philippines, the Bahamas, the Seychelles, the Maldives, Kiribati, the Federated States of Micronesia, the Marshall Islands and Tuvalu.

The *territorial sea* includes the area seaward of the baseline, with a breadth not exceeding twelve nautical miles (approximately 22 kilometres).⁷³ The sovereignty of the coastal State in the territorial sea is limited by the right of innocent passage enjoyed by the ships of all States.⁷⁴ In those parts of the territorial sea which constitute an international strait, foreign ships and aircraft may exercise an even further-reaching right of transit passage (similar to archipelagic sea lanes passage).⁷⁵

Turning to the areas under functional jurisdiction, the *contiguous zone* is an area beyond and contiguous to the territorial sea, in which the coastal State may exercise certain law-enforcement powers. These powers are limited to the control necessary to prevent any infringements of the coastal State’s customs, fiscal, immigration or sanitary laws and regulations within its territory or territorial sea, and to punish any infringements of these laws and regulations committed within its territory or territorial sea. In this zone the coastal State also has a certain authority over objects of an archaeological or historical nature located on the seabed.⁷⁶ The contiguous zone may not extend beyond 24 nautical miles from the baseline.⁷⁷

The *exclusive economic zone* (EEZ) is an area, beyond and adjacent to the territorial sea, up to 200 nautical miles (approximately 370 km) from the baseline.⁷⁸ Thus, this zone overlaps with the contiguous zone. In the EEZ the coastal State

⁶⁸ Art. 8(1) LOSC.

⁶⁹ Art. 2(1) LOSC. A limitation of this sovereignty (the right of innocent passage for foreign ships) may exist in some parts of the maritime internal waters according to Art. 8(2) LOSC.

⁷⁰ Art. 49 LOSC.

⁷¹ Artt. 52-54 LOSC.

⁷² Appendix 3 to ILA Baselines report 2018.

⁷³ Art.3 LOSC.

⁷⁴ Artt. 16-32 LOSC.

⁷⁵ Artt. 34-44 LOSC.

⁷⁶ Art. 303(2) LOSC.

⁷⁷ Art. 33 LOSC.

⁷⁸ Artt. 55 and 57 LOSC.

has sovereign rights for the purpose of exploring and exploiting, conserving and managing the natural resources, both living and non-living. The zone comprises the water column, the seabed and its subsoil. The sovereign rights of the coastal State also include other activities for the economic utilization of the zone, such as the production of energy from the water, currents and winds. In addition, the coastal State has in its EEZ certain specified jurisdiction with regard to the establishment and use of artificial islands, installations and structures, the conduct of marine scientific research, and the protection and preservation of the marine environment. In the EEZ, however, all States enjoy freedom of navigation and overflight.⁷⁹

The *continental shelf* of a coastal State comprises the seabed and subsoil of the submarine areas that extend beyond the territorial sea throughout the natural prolongation of its land territory to the outer edge of the continental margin, or to a distance of 200 nautical miles from the baselines where the outer edge of the continental margin does not extend up to that distance.⁸⁰ Up to 200 nautical miles the continental shelf thus coincides with the EEZ. The outer limit of the continental margin, which is defined in the LOSC in a highly complicated way, can in some cases be located at a distance of several hundred nautical miles beyond the 200 mile line.⁸¹ In those cases, coastal States will have to submit information to a commission (the Commission on the Limits of the Continental Shelf) in order to establish that the claimed area is indeed covered by the requirements set out in Art. 76 LOSC.⁸² The coastal State exercises sovereign rights over the continental shelf for the purpose of exploring it and exploiting the mineral resources of the shelf (in practice mainly oil and gas), as well as the sedentary species present.⁸³

Beyond these maritime zones where coastal States have certain jurisdiction are the high seas and the international seabed area. In the *high seas* (the water column beyond the EEZ)⁸⁴ the principle of the freedom of the high seas applies. This freedom includes, *inter alia*, the freedom of navigation, the freedom of overflight, the freedom of fishing, the freedom to lay submarine cables and pipelines and construct artificial islands and installations, and freedom of scientific research.⁸⁵ The seabed beyond the continental shelf constitutes the *international seabed area* (the ‘Area’). The Area and its natural resources, defined as “all solid, liquid or gaseous mineral resources *in situ* in the Area at or beneath the seabed, including polymetallic nodules”,⁸⁶ are declared the common heritage of mankind.⁸⁷ The

⁷⁹ Art. 56 LOSC. The content and scope of these rights and jurisdiction of the coastal State, and the rights of other States, are further defined in Artt. 58-73 LOSC, in Part XIII LOSC (marine scientific research) and in Part XII LOSC (protection and preservation of the marine environment).

⁸⁰ Art. 76(1) LOSC.

⁸¹ Art. 76(2)-(8) LOSC.

⁸² Annex II LOSC.

⁸³ Art. 77 LOSC.

⁸⁴ Art. 86 LOSC.

⁸⁵ Art. 87 LOSC.

⁸⁶ Art. 133 LOSC.

⁸⁷ Art. 136 LOSC.

exploration and exploitation of the mineral resources of the Area is to be carried out under the authority of the International Seabed Authority (ISA).⁸⁸

As stated above, the various maritime jurisdictional zones, with the exception of the extended continental shelf, may extend up to a maximum distance from the baseline, e.g., 12 or 200 nautical miles. Those maximum distances can obviously only be reached when there are no opposite or adjacent coastal States situated at a distance of less than 24 or 400 nautical miles, respectively. If such opposite or adjacent States are present, then the coastal States involved will have to reach agreement on the delimitation of their respective areas. If agreement has been reached this is usually recorded in a delimitation (maritime boundary) treaty. The negotiations preceding such a treaty are often complex and protracted, because many factors may be involved and the interests may be great. If no agreement is reached, the governments concerned may jointly decide to have the boundary determined by a judicial body, such as an arbitral tribunal or court (the International Court of Justice or the International Tribunal for the Law of the Sea). It is also possible that one party unilaterally makes such request, if there is a basis for the jurisdiction of such court or tribunal.

The provisions of the LOSC on the ways to delimit of the territorial sea and the EEZ are not identical. While for the territorial sea the median line plays an important role, for the continental shelf and EEZ the Convention stipulates that the delimitation must be effected by agreement on the basis of international law, “in order to achieve an equitable solution.” State practice, and in particular judicial decisions, have clarified the methods and criteria to be applied in order to achieve such result.⁸⁹ There are many maritime areas still to be delimited. Of the approximately 400 potential maritime boundaries in the world, currently less than 60% have actually been delimited by an agreement or judicial decision.

5.4 **Consequences of sea level rise in situations where there are no boundaries established with neighbouring States**

Firstly, the consequences of the application of the current international legal rules concerning the normal baseline, i.e. the low-water line, will be examined. As a consequence of sea level rise, this line will shift landwards or, in cases of low-lying islands and low-tide elevations, may even disappear completely. Thus, since the low-water line moves, the legal baseline moves: the baseline is ‘ambulatory.’⁹⁰ The horizontal distance over which the baseline shifts in a landward direction obviously depends on the gradient of the land surface in the area involved: the lesser the gradient, the greater the distance. In some areas a rise in the sea level of 0.5 meter can shift the baseline for tens of kilometres inland. Because of the landward shift of the baseline, the outer limits of the territorial sea, contiguous zone

⁸⁸ As provided in Part XI LOSC.

⁸⁹ M.D. Evans, *Maritime Boundary Delimitation*, in D.R. Rothwell, A.G. Oude Elferink, K.N. Scott and T. Stephens (eds.), *supra* n. 11, pp. 254-279.

⁹⁰ ILA Committee on Baselines in the Law of the Sea, 2012 report.

and EEZ will also shift landward accordingly. The breadth and thus the extent (area) of these zones remains the same; only the location of the inner and outer limits changes.

As far as the continental shelf is concerned the consequences are less clear. The LOSC contains a remarkable provision in Art. 76, paragraph 9, which reads as follows:

The coastal State shall deposit with the Secretary-General of the United Nations charts, and relevant information, including geodetic data, *permanently* describing the outer limits of its continental shelf. The Secretary-General shall give due publicity thereto [emphasis added].

As far as the continental shelf's outer limit extending beyond 200 nautical miles is concerned, this provision may be not that remarkable, since in that case the outer limit is partly determined by geological and morphological factors which are not affected by sea level rise.⁹¹ That outer limit thus remains. This also follows clearly from the provision in paragraph 8 of Art. 76, which states that the limits of the continental shelf established by a coastal State on the basis of the recommendations of the Commission on the Limits of the Continental Shelf are final and binding. The breadth of the continental shelf, however, increases since the outer limit of the territorial sea has shifted landward (the continental shelf in the legal sense starts beyond the territorial sea). When the outer limit of the continental shelf extending exactly to 200 nautical miles is involved, however, this provision is remarkable for it could be seen as also fixing that boundary, notwithstanding possible later regression of the baseline. This is the more remarkable since such a provision has not been included for the outer limit of the EEZ (also 200 miles), even though the regime of the EEZ includes jurisdiction over seabed resources. Views differ on how to interpret this provision. The ILA Committee on Legal Issues of the Continental Shelf in its 2006 report, after examining both possible interpretations (either only limits beyond 200 miles are covered; or also limits of exact 200 miles) prefers the former.⁹²

If the rationale for paragraph 9 was to permanently fix the boundary between the (national) continental shelf and the international seabed area, in view of the legal security which is of great importance for the holders of concessions for mining activities, there are no convincing reasons for treating a continental shelf limit beyond 200 nautical miles any differently from a 200 mile continental shelf limit. It would seem unjust if, for example, an outer limit located because of geological or morphological factors at 210 nautical miles from the baseline would become fixed, whereas a 200 mile limit would not be. Thus it could be argued that the effect of this provision is that also the 200 mile outer limit of the continental shelf, in case of regression of the baseline remains unchanged and that the breadth

⁹¹ But see paragraph 6 of Art. 76 LOSC which contains a reference to the baseline in combination with a distance of 350 nautical miles for the extended continental shelf.

⁹² 2006 Committee report, pp. 16-17.

of the shelf increases. An area of seabed which formerly came under the regime of the territorial sea then comes under the regime of the continental shelf.

A totally different situation occurs when an island or a low-tide elevation disappears entirely. In such a case it is possible that the area of the territorial sea and EEZ decreases. Whether or not, and to what extent, that will be the case depends on the geographical configuration of the area.⁹³ Especially in the case of islands the extent of the maritime area lost can be substantial. The farther the disappeared island was located from a remaining baseline (the coast of the mainland or of a remaining other island), the greater the loss of maritime area. The extent of the loss is determined, among other factors, by the area of the former island, but even in cases of the smallest islands substantial areas may be involved. For example, if the island was situated at a distance of 24 nautical miles from the remaining baseline, the area of territorial sea may decrease by approximately 1500 square kilometres. The area of the EEZ may even decrease by approximately 8,000 square kilometres. If the island was situated at a distance of 200 nautical miles from the remaining baseline, then the loss of the EEZ-area can amount to over 215,000 square kilometres. In an extreme case, when the island was located farther than 400 nautical miles, the loss of the EEZ-area would even amount to 431,000 square kilometres. Such cases are not purely hypothetical; they may occur in practice in particular in the Pacific Ocean.

It should be emphasized, however, that the potential losses of EEZ-area just mentioned may not occur in all cases, because the feature involved already before its disappearance did not generate an EEZ. Although every island, as defined in the LOSC, has its own territorial sea, according to Art. 121(3) LOSC ‘rocks which cannot sustain human habitation or economic life of their own’ have no EEZ or continental shelf. The term ‘rock’ in this provision must not be interpreted literally as referring to a solid, rocky formation, but also covers features made up of other natural substances. What exactly is to be understood by the phrase ‘which cannot sustain human habitation or economic life of their own’ has been, and still is, a topic of considerable academic debate. The 2016 Arbitral Award in the *South China Sea* arbitration⁹⁴ was the first international decision providing a detailed interpretation of the terms of paragraph 3 of Art. 121 LOSC, and future decisions and State practice will further clarify the precise meaning of the phrase.

A remarkable situation again may arise with respect to the limits of the continental shelf in the case of a disappearing island. As a consequence of the provision in Art. 76(9) LOSC already mentioned, the outer limit of the continental shelf may be permanently fixed. Once the outer limit of the continental shelf has been established at a distance of 200 nautical miles (or even more) from an island, which island subsequently disappears entirely, the coastal State would maintain sovereign rights and jurisdiction over a seabed area (maybe of considerable extent), while the object that created these rights no longer exists.

⁹³ In particular the presence of other high-tide features.

⁹⁴ <<https://pca-cpa.org/en/cases/7/>>.

So far, the situations considered involved those in which neighbouring coastal States were absent. Should they be present, however, but no delimitation agreements are in force (to be discussed in the next paragraph), the shifting of the baseline as a result of sea level rise may still cause changes to the outer limit. This will, for example, be the case when two coastal States are situated less than 24 miles from each other. If no delimitation agreement has been concluded, and special circumstances are absent, the limit will be the median line.⁹⁵ This median line will shift somewhat when the baselines of both States have shifted in an asymmetrical way as a result of sea level rise. When two States are located less than 400 nautical miles opposite each other, the same could apply to the boundary between their respective EEZs and continental shelves, but here the median line plays a much less prominent role with respect to entitlement than in the case of the territorial sea.⁹⁶ The situation in such cases can be very complex, and the circumstances are unique in every case. Therefore it is impossible to arrive at any general conclusions.

We now turn to cases where the baseline is not formed by the low-water line, but by *straight baselines*. These straight baselines connect points located on the mainland (including large islands), on islands along the coast and, in exceptional cases, on low-tide elevations (namely when lighthouses or similar installations which are permanently above sea level have been built on them or in instances where this has received general international recognition). The question which arises here is whether, in case the points established by the coastal State have permanently become located below the surface of the sea as a result of sea level rise,⁹⁷ the coastal State is obliged to substitute those points by new ones which do meet the applicable criteria. This could lead to significant shifts in the outer limits of the territorial sea and EEZ. The same question arises with respect to the baseline drawn across the mouth of rivers and bays and, in the case of archipelagos, the archipelagic baselines drawn by the archipelagic State. It is even possible that an archipelagic State would lose its status as archipelagic State as a result of such changes.

Before answering this question it is useful to deal briefly with the special provision included in the LOSC for the particular situation of a coastline which is highly unstable because of the presence of a delta and other natural conditions. Here, situations are involved where the coastline is permanently changing significantly, sometimes regressing (landward), sometimes progressing (seaward). The coast of Bangladesh is a good example. In such cases art. 7(2) offers the coastal State the opportunity at a certain moment to draw straight baselines between fixed points along the furthest seaward extent of the low-water line.⁹⁸ The article further

⁹⁵ Art. 15 LOSC.

⁹⁶ Artt. 74 and 83 LOSC.

⁹⁷ Or in cases where a point was located on an island which through sea level rise has become a low-tide elevation, but on which no lighthouse has been erected.

⁹⁸ K. Trümpler, in A. Proelß (ed.), *United Nations Convention on the Law of the Sea. A Commentary*, C.H. Beck 2017, pp. 75-77.

provides that, notwithstanding subsequent regression of the low-water line, the straight baselines remain effective until changed by the coastal State. The intention of this provision was that the outer limit of the maritime zones (territorial sea, EEZ) of the coastal State concerned does not change continuously. Sea level rise would in such situations have an accelerating effect on the regression of the low-water line, but the straight baselines drawn would prevent this from having (for the time being) any effect on the seaward limits of the maritime zones concerned. The stipulation that these straight baselines remain effective until changed by the coastal State raises the question whether the coastal State is obliged to do this at some point in time, in order to bring them into line with the changed physical situation, or whether the coastal State is entirely free to decide whether or not to change these straight baselines. It is submitted that it was not the intention to grant the coastal State full discretionary power, and that in principle the coastal State would need to adapt these baselines when the furthest seaward extent of the low-water line has significantly moved.

Returning now to the question about the other straight baselines: the coastal State under the current law is supposed to replace the former points by new ones, when the former are no longer in accordance with the requirements of Art. 7 LOSC. When coastal States adapt their straight baselines as a result of sea level rise this will generally mean that the extent of their maritime internal waters decreases. The same applies to archipelagic waters, with even the possibility that the entitlement to claim archipelagic waters ceases. The areas of territorial sea and EEZ generally will not decrease, but they will shift landward. The limit of the continental shelf, it could be argued, remains unchanged. In the case of neighbouring coastal States the same conclusions apply as those indicated above where the consequence of shifts in the low-water line was discussed.

5.5 Consequences of sea level rise in situations where boundaries have been established with neighbouring States

5.5.1 Application of the general rules

This paragraph deals with a completely different situation, namely that in which there is a delimitation agreement in force for the area concerned or that the area has been delimited through the decision of an international court or tribunal. This implies that two coastal States are situated either less than 400 nautical miles from each other (in which case the EEZ and/or continental shelf have been delimited), or less than 24 nautical miles from each other (in which case a territorial sea boundary is involved). It is also possible that an extended continental shelf boundary beyond 200 nautical miles between two States has been delimited.

Delimitation agreements may involve the formal establishment of the equidistance or median line between the two coastal States as the boundary line (or a boundary based on this line). In many instances, however, another line has been established as the boundary, in particular because of special circumstances such as the geographical configuration of the coastlines or the presence of islands. Some-

times it involves a combination of both systems. When the equidistance or median line has been chosen as the boundary line, this may be incorporated in the boundary agreement in two ways. The method almost always used is to establish the equidistance line (at least, a boundary line based on that line) by way of lines drawn between points the exact location of which has been established by geographical coordinates. Another, only occasionally used method involves the mere reference in the agreement to the equidistance line as forming the agreed-upon boundary line.⁹⁹

The question may arise what will be the consequences for the boundary lines established by these agreements of changes in the geographical configuration (especially the location of baselines) as a result of sea level rise – changes therefore of the original circumstances on which the agreed boundary was based. In cases where the delimitation agreement explicitly refers to the equidistance line the boundary may shift as a result of sea level rise: asymmetrical changes of the baselines of both States will lead to changes in the location of the equidistance line. The States concerned have deliberately opted for a (potentially) fluctuating boundary line. In all other cases, where the boundary line has been fixed by geographical coordinates, it must in principle be concluded that changes in the geographical configuration as a result of sea level rise will not result in changes in the boundary line. ‘In principle’ means that there may be exceptions. Which circumstances may conceivably lead to the adjustment of an agreed boundary line?

5.5.2 *Adjustment of boundaries established by agreement*

It is obvious that the two coastal States concerned by mutual agreement may decide to adjust the boundary line. It is even possible that a delimitation agreement itself stipulates that the line may be adjusted in the future as a result of specific circumstances.¹⁰⁰ What is more interesting, however, is the question whether one of the two States may demand that an adjustment be made and, in the absence of agreement thereon, may unilaterally terminate the delimitation agreement. The establishment of a new boundary is of course only possible by mutual agreement. In the first instance, for the purpose of answering this question a distinction could be made between two situations.

The first situation involves delimitation agreements which explicitly provide that the boundary is meant to be definitive, notwithstanding future changes in the baselines of the parties. To be equated with this situation are the cases where in another way (for example, from the *travaux préparatoires* or parliamentary debates on the delimitation agreement) the same intention of both parties can be explicitly determined. An example of such a case is the continental shelf delimitation agreement between the United Kingdom and the Netherlands of 1965, which in fact

⁹⁹ An example is provided by the maritime delimitation treaty between Tonga and France (Wallis and Futuna) of 11 January 1980. See *The Law of the Sea. Maritime Boundary Agreements* (1970-1984), United Nations (1987), pp. 273-275.

¹⁰⁰ See the examples cited in the 2018 report of the ILC Committee on International Law and Sea Level Rise, p. 23.

involved fixing the then equidistance line.¹⁰¹ When in subsequent years the Netherlands baseline shifted seaward in some areas (through both natural and artificial processes, up to over 7 kilometres in the instance of the *Tweede Maasvlakte* extension of the port of Rotterdam), this had no effect whatsoever on the location of the boundary of the continental shelf with the United Kingdom. In such cases, it is submitted, one party to the delimitation agreement may not unilaterally decide to terminate the agreement because of the shifting of a baseline.

The second situation concerns delimitation agreements which do not explicitly refer to the boundary line being definitive notwithstanding changes in the location of the baseline. Would there be any grounds which may be invoked to justify unilateral termination of a delimitation agreement? It is conceivable that a State would wish to invoke a change of circumstances since the conclusion of the agreement. In general, in exceptional cases it is possible for a State to invoke a fundamental change of circumstances in order to terminate a treaty; public international law makes this subject to the fulfilment of very stringent conditions. These conditions are laid down in Art. 62(1) of the Vienna Convention on the Law of Treaties (VCLT), a provision which is considered to reflect a rule of customary international law.

In the first place, it should involve a change of circumstances which was not foreseen by the parties at the time of the conclusion of the treaty. It can be disputed whether in all cases sea level rise can be considered as an unforeseen circumstance. The phenomenon of changes to the baseline as a result of natural causes has always been known, but the rise in sea level expected now due to global warming is of a different nature. But then one might make a distinction between treaties dating from before the current knowledge about sea level rise and treaties concluded since the extent of this phenomenon became known. Furthermore, it should involve changes to the original circumstances the existence of which constituted an essential basis of the consent of the parties to be bound by the treaty, and the effect of the changes should radically transform the extent of the obligations still to be performed under the treaty. Thus, a very substantial change in the location of the baseline should be involved, for example as a consequence of the complete disappearance of an island farther offshore. But even then it would be hard to envisage that the conditions of Art. 62(1) VCLT could be fulfilled.

However, treaties establishing a boundary have been explicitly excluded from this possibility to invoke a fundamental change of circumstances, in paragraph 2(a) of Art. 62 VCLT.¹⁰² The main underlying rationale for this rule is that any possibility for calling into question boundary agreements would result in a permanent source of serious international political tensions. The main question here is if

¹⁰¹ Agreement between the Government of the Kingdom of the Netherlands and the Government of the United Kingdom of Great Britain and Northern Ireland relating to the delimitation of the Continental Shelf under the North Sea between the two Countries, London 6 October 1965; *Trb.* 1965, No. 191.

¹⁰² Art. 62(2) VCLT reads: "A fundamental change of circumstances may not be invoked as a ground for terminating or withdrawing from a treaty: (a) if the treaty establishes a boundary;"

maritime boundaries are included in the notion of boundaries as used in Art. 62(2) VCLT. As far as territorial sea boundaries are concerned there can be little doubt that this is the case, since they delimit areas under the sovereignty of States. For EEZ and continental shelf boundaries one could argue that they do not constitute territorial boundaries in a strict sense, since they demarcate areas for the purpose of exercising sovereign rights and jurisdiction, rather than sovereignty. The *travaux préparatoires* of the VCLT do not clarify this, but it should be realized that at the time (1960s) the question of delimitation of the continental shelf did not attract much attention and the EEZ did not yet exist.¹⁰³ During the preparations for the drafting of the Vienna Convention on the Law of Treaties between States and International Organizations or Between International Organizations, this question was raised in the ILC but only cursorily and without firm conclusion.¹⁰⁴ However, the ICJ in an *obiter dictum* in the *Aegean Sea Continental Shelf* case, regarded a continental shelf boundary as included within the Art. 62(2)(a) exception, and the Arbitral Tribunal in the *Bay of Bengal* maritime boundary case in its Award noted that

maritime delimitations, like land boundaries, must be stable and definitive to ensure a peaceful relationship between the States concerned in the long term [...] In the view of the Tribunal, neither the prospect of climate change nor its possible effects can jeopardize the large number of settled maritime boundaries throughout the world. This applies equally to maritime boundaries agreed between States and to those established through international adjudication.¹⁰⁵

It must therefore be concluded that in accordance with the present rules of international law a State is not entitled to invoke changed circumstances as a result of sea level rise in order to unilaterally terminate a maritime delimitation agreement. The same conclusion applies to boundaries established by a decision of an international court or arbitral tribunal.

¹⁰³ Although there were claims to fisheries jurisdiction beyond the territorial sea at that time, the concept of the EEZ only gained recognition later in the 1970s during the Third UN Conference on the Law of the Sea.

¹⁰⁴ The ILC explained that the ‘term “boundary” customarily denotes the limit of the land territory of a State, but it could conceivably be taken more broadly to designate the various lines which fix the spatial limits of the exercise of different powers.’ The ILC took the view that lines could be boundaries for certain purposes and not others, e.g., opposable to other States while not conferring exclusive jurisdiction. The ILC considered that territorial sea boundaries were ‘true limit[s] of the territory of the State’ but that, even if other maritime boundaries, and boundaries to air space could also be categorized as ‘true boundaries’, they might not fall within the boundary exclusion of Article 62(2)(a) of the Vienna Convention. Therefore, the ILC had left the question open as it relates to maritime boundaries beyond those of the territorial sea. Yearbook of the ILC 1982, volume II, part 2 ‘report of the Commission to the General Assembly on the work of the thirty-fourth session’ (3 May–23 July 1982) UN Doc A/CN.4/SER.A/1982/Add.1 (Part 2) pp. 60-61.

¹⁰⁵ PCA Case 2010-16. Award of 7 July 2014, paragraphs 216-217.

5.6 The interests involved

It is now appropriate to briefly consider the interests involved in changes in the location of maritime limits and boundaries. A distinction can be made between a shift in the limit or boundary line, and a decrease of the area of the maritime zone.

Shifting of the limit or boundary is of particular importance with respect to the exercise of jurisdiction. For activities at sea it is essential to know in which maritime jurisdictional zone they take place: the regimes differ, sometimes only in detail, sometimes substantially. To give a few examples:

When, as a result of sea level rise, the outer limit of the territorial sea shifts landwards this can mean that in the sea area concerned the regime of the EEZ is substituted for that of the territorial sea. For international navigation this would entail the replacement of the right of innocent passage by the freedom of navigation: national legislation of the coastal State can then only be applied and enforced to a very limited extent to foreign vessels. Warships of other States will have greater flexibility of movement there; submarines may navigate submerged. The powers of the coastal State with respect to wrecks are more limited.

Archaeological and historical objects, which because of the regression of the baseline are no longer situated within the contiguous zone (up to 24 nautical miles), can no longer be protected by the coastal State under the provisions of Art. 303 LOSC.¹⁰⁶

Landward shifting of the outer limit of the EEZ may mean that the jurisdiction of the coastal State with respect to fishing, the conduct of marine scientific research and the protection of the marine environment for that part of the sea would be replaced by the regime of freedom of the high seas. It is also possible, however, that those activities would then be conducted in the EEZ of another (neighboring) coastal State, thus being subject to different national legislation.

The *decrease of the area* of maritime zones under the jurisdiction of a coastal State mainly has repercussions for the economic interests of the State concerned, in particular fishing interests. (Should the outer limit of the continental shelf of 200 miles not have been permanently fixed, the great economic interests associated with the exploitation of oil and gas would also be involved.) Among other things, this may mean less income from fishing licences, but also fewer possibilities for the coastal State to take conservation and management measures with respect to the fish stocks in the area involved (even though its own fishermen may keep on fishing there under the freedom of fishing).

A decrease in the area of maritime zones may especially occur in the case of archipelagic States and other States with islands along the coast. Such a decrease may involve areas of several tens of thousands of square kilometres or even sev-

¹⁰⁶ Art. 303(2) LOSC allows coastal States to extend their jurisdiction for the protection of objects of archaeological and historical nature to the contiguous zone area. It is to be noted that the UNESCO Convention on the Underwater Cultural Heritage even allows such extension to the EEZ and continental shelf area; Convention on the Underwater Cultural Heritage, 2 November 2001, entered into force 2 January 2009, Art. 10.

eral hundreds of thousands of square kilometres. Coastal States would not wish to see that happen, and will undoubtedly attempt to prevent this from happening. The next sub-section will deal with the question which possibilities may exist for this purpose.

5.7 Possible approaches to prevent the loss of entitlements

5.7.1 *Artificial conservation of the baseline*

The most obvious means to prevent or reduce the negative effects of sea level rise is the artificial conservation of the baseline. As far as the *low-water line* is concerned, this means the construction or reinforcement of sea defences (shoreline protection). This is at present already being done frequently. Further sea level rise will necessitate large financial investments. For many countries in the world, however, the costs associated with the conservation of the entire current low-water line may turn out to be unsurmountable, quite apart from the huge technical problems to be solved. Many aspects are involved in such projects, including nature preservation because of possible damage to ecosystems.

Artificial conservation of the coastline, including that of islands, is fully permitted under public international law. This is proved by abundant State practice. One marginal note may still be made here, with respect to extreme situations. In Art. 121(1) LOSC an island is defined as ‘a *naturally formed* area of land, surrounded by water, which is above water at high tide’ (emphasis added). One could argue that islands which would have disappeared entirely as a result of sea level rise but have been maintained exclusively by artificial means no longer comply with the requirement of being ‘naturally formed.’ They will have become ‘artificial’ islands. According to Art. 60(8) LOSC artificial islands in the EEZ do not possess the status of islands. They have no territorial sea of their own and their presence does not affect the delimitation of the territorial sea, EEZ or continental shelf.

It is submitted, however, that this provision, apart from the fact that it relates to the EEZ, is concerned exclusively with newly constructed artificial islands. The artificial conservation of an island once formed by nature does not result in its losing its international legal status of ‘island.’ This is also the case if the artificial conservation was exclusively intended to preserve the baseline for the purpose of maritime entitlement. Maintaining jurisdictional spaces may for one coastal State (e.g. Tuvalu) represent an equivalent and legitimate interest as compared to another coastal State (e.g. the Netherlands) maintaining its land spaces.

Also the artificial conservation of an island exclusively for the purpose of preventing it from degenerating, as a result of sea level rise, to the status of ‘rock’ as provided in Art. 121(3) LOSC (and thus no longer generating an EEZ) should be regarded as permissible.

In the case of *straight baselines* the question may be raised whether it is allowed to construct a lighthouse (or similar installation) on a disappearing island on which a connecting point for straight baselines is located, exclusively for the purpose of

preserving the point for the drawing of straight baselines. It is submitted that, quite apart from the fact that it may be difficult to prove that the construction was exclusively for this purpose, such action may be regarded as permissible.

The current rules of the law of the sea on baselines and maritime entitlements in fact provide a perverse incentive to States to spend huge amounts of money on artificial conservation of the baseline purely for the purpose of maintaining maritime entitlements. Such funds could be better spent on other societal needs. Especially since the coastal States most affected by sea level rise are the ones that have contributed the least to the causes of global warming. Therefore, other options should be pursued for ensuring that coastal States confronted with loss of maritime spaces as a result of sea level rise can maintain their current entitlements. These options are of a legal nature, and thus much less expensive, and will be explored in the following paragraphs.

5.7.2 *Conclusion of maritime boundary agreements*

In the case of States which have neighbouring States with overlapping entitlements to maritime jurisdictional zones, but which zones have not yet been delimited by agreement, the first option that such States have to ensure that their current entitlements would be safeguarded against future sea level rise is to conclude maritime boundary agreements. As seen above, in paragraph 5.5.2, boundary treaties may not be unilaterally terminated so they are permanently fixing entitlements. This consideration may have played a role in the recent conclusion of a series of maritime boundary agreements in the Pacific (see sub-section 5.8 below). The discussion of the options in the following paragraphs therefore in fact concerns the situations where no neighbouring States are present.

5.7.3 *Claims of historic rights*

It has been suggested in the past¹⁰⁷ that a coastal State might attempt to invoke a claim of 'historic rights' to maintain its entitlement to particular sea areas which as a result of the rising sea level and consequential regression or disappearance of the baseline would be lost by application of the current rules on baselines and entitlements. A coastal State could maintain the outer limits of its territorial sea and of its EEZ where they were originally located before significant sea level rise occurred.¹⁰⁸ As a consequence, the breadth of its territorial sea would gradually become more than twelve nautical miles (or a territorial sea enclave would exist where a former island has disappeared), and the outer limit of its EEZ would be located ever further than 200 nautical miles from the baseline (or, again in an extreme case of a disappeared island, the EEZ could become an enclave in the high seas).

¹⁰⁷ Soons, *supra* n. 53.

¹⁰⁸ The limit of the continental shelf would not be affected by sea level rise, in any case the limit of an extended continental shelf (see above).

Such claims must be distinguished from claims to historic waters. International law has long recognized the possibility that the sovereignty of a coastal State extends, in exceptional cases based on historic title, to an area of the sea which according to the general rules concerning baselines would not fall under its sovereignty, but under the regime of the high seas (or, more recently, the continental shelf and EEZ). Historic waters can be defined as waters over which the coastal State, in deviation of the general rules of international law, has been exercising sovereignty, clearly and effectively, without interruption and during a considerable period of time, with the acquiescence of the community of States. Such areas are governed by the regime of maritime internal waters.¹⁰⁹

In the case of sea level rise, however, the coastal State would be claiming a certain sea area as its territorial sea or EEZ. It does not concern historic waters in the traditional sense, but it would involve a new category of historic claims. For such cases one could require, *mutatis mutandis*, that the following conditions be met: the coastal State should, right from the start of the regression of the baseline, continue to exercise sovereignty or sovereign rights in the area concerned, in the same way as it used to do before, and this should be acquiesced in by the community of States.¹¹⁰ Acquiescence by the community of States may be inferred from the absence of protests by interested States.

Although in theory it is possible that such a situation might develop,¹¹¹ it seems that reliance on this notion does not offer serious prospects of success. A notion of historic rights would involve assessing each individual claim by a coastal State in the light of the particular circumstances and conduct of that State, and the reactions of other interested States, over a period of time. It could thus lead to different outcomes for different States. However, the problems caused by sea level rise are of a general nature, affecting a large number of States and require a uniform approach; it concerns a general category of geographic situations which should be treated equally and not on a case-by-case basis where some States could succeed and others not. The problem of sea level rise rather calls for general rules which in similar cases can be applied by all coastal States.

5.7.4 *Formal changes of the law*

Since the problem is caused by the current rules on baselines and maritime entitlements an obvious option would seem to be to try and change these rules. Since these rules are included in the LOSC an obvious option would be to amend the

¹⁰⁹ L.J. Bouchez, *The regime of bays in international law* (1964), pp. 199-302 (in particular p. 281).

¹¹⁰ The coastal State would have to indicate expressly that it retains the original limits. A problem could be caused by the fact that published charts may periodically indicate the changed low-water line (baseline). Art. 16(2) requires coastal States to deposit a copy of these charts with the secretary-General of the United Nations. In such cases the coastal State should thus explicitly comment on the new low-water line with respect to its function (or rather, non-function) as a baseline.

¹¹¹ The *South China Sea* arbitral award dealt with the notion of historic rights; Award of 12 July 2016, pp. 97-117.

relevant provisions by way of the formal amendment procedures of the Convention.¹¹² An alternative option would be to negotiate a separate instrument for this purpose (an “Implementing Agreement”). Other options that have been suggested are the adoption of a Protocol to the UNFCCC, or an entirely separate treaty, either on a global or on a regional basis.

However, the disadvantages and dangers of these options at this stage are such that they offer few prospects for success, in particular because intergovernmental negotiations on these sea level rise issues may not remain isolated and could trigger the inclusion of other, more controversial, issues. It is better, therefore, to look at informal ways: developing the interpretation of the current LOSC provisions in practice or/and the development of new rules of customary international law.

5.7.5 *Developing State practice under the LOSC*

Three basic options for achieving the result of maintaining entitlements to maritime jurisdictional areas have been identified:

- Maintaining the baseline (which would at the same time maintain the outer limits of the territorial sea and of the EEZ)
- Maintaining the outer limit of the EEZ only
- Maintaining both the limits of the territorial sea and of the EEZ

Maintaining the baseline

Maintaining the baseline automatically means that the outer limits of all maritime zones measured from that baseline will also be maintained. It is possible to formally maintain the baseline existing at a particular moment in time (prior to anticipated - significant - sea level rise) by describing it by means of geographical coordinates and depicting it on a chart and not subsequently changing it when sea level rise has moved its location or has led to its disappearance. This would include maintaining basepoints used for straight baselines that would no longer qualify as such under the current rules. Charts permanently describing these baselines and basepoints could be deposited with the Secretary-General of the United Nations. The result of this policy would be that the breadth of the territorial sea remains at twelve nautical miles, and that the outer limits of the contiguous zone and EEZ

¹¹² The LOSC provides for two possible amendment procedures. The regular procedure (Art. 312) involves holding a conference to consider proposed amendments if, within 12 months after one or more parties have proposed specific amendments, at least one half of the parties have supported such request. The decision-making procedure applicable at the amendment conference shall be the same as that applicable at the Third UN Conference on the Law of the Sea, unless otherwise decided by the conference. The conference should make every effort to reach agreement by consensus and these should be no voting until all efforts at consensus have been exhausted. The other, simplified procedure (Art. 313) involves a proposed amendment which is considered adopted if, after twelve months from the date of the circulation of the proposal, no State party has objected. In both cases the proposed amendment may not relate to activities in the Area; such proposed amendments are subject to the procedure in Art. 314.

also remain as they were and in accordance with their maximum width. The waters located landward of the fixed baseline (maritime internal waters) would be extended. Updating of nautical charts by hydrographic surveying for the purpose of indicating the baseline (art. 5 LOSC) would no longer be required. However, this will not mean that such surveying is no longer necessary: the charts will still need to be updated for navigational safety and other purposes.

The current exclusive authority (sovereignty) of the coastal State over maritime and land territory would thus be fully maintained, although the dry land will have become internal waters. This policy would, in case of baselines of the mainland or larger islands, result in a situation where areas at the outer end of the territorial sea, which otherwise would have become part of the EEZ, will remain subject to the regime of the territorial sea where the right of innocent passage applies, rather than become subject to the freedom of navigation as applying in the EEZ. But in the case of completely disappeared islands, a situation that will occur frequently in some parts of the ocean, it would result in (tiny) areas of internal waters surrounded by (significant) areas of territorial sea, as enclaves within the EEZ, still subject to the regime of innocent passage rather than freedom of navigation. The maintained EEZ would mean that significant parts of the sea will not become high seas.

This option would result in the fullest conservation of all coastal State rights and interests in its current offshore areas, and the extent of its sovereign territory.

Maintaining the outer limit of the EEZ only

This option would involve only permanently describing the outer limits of the EEZ by geographical coordinates and depicting them on charts, on the basis of the current baselines determined in accordance with the current law. The rules on baselines would remain intact, meaning that the baselines remain ambulatory and would move landward, and the width of the territorial sea would remain at twelve nautical miles. The width of the EEZ would (sometimes significantly) increase. There would be no enclaves of internal waters and territorial sea within the EEZ. However, there may be enclaves of EEZ in the high seas in case of a disappearing island very far offshore.

This option would ensure that the coastal State's sovereign rights and jurisdiction over its natural resources, and other EEZ rights, are conserved, but would involve the least intrusion on the current rules on baselines and other rules of the law of the sea.

Maintaining the outer limits of the EEZ and territorial sea

A policy of not maintaining the baseline, but only the outer limits (by describing them with geographical coordinates, and depicted on charts) of both the territorial sea and the EEZ would mean that the current rules on the location of the baseline (both the normal baseline and the straight baseline) would remain intact. The baseline will move landward, thus extending the width of the territorial sea, while

the width of the EEZ would remain the same. In this option, enclaves of territorial sea (but not of internal waters) would remain after an island has disappeared.

This option would result in the conservation of the coastal State's sovereign rights and jurisdiction in its EEZ and would retain the sovereign territorial sea area, but the latter would expand landward and would thus become wider than 12 nautical miles.

Evaluation

Which of the three options is to be preferred depends on the weight one attaches to the various implications of the options. In particular, if the main objective to be achieved would be to safeguard the economic (natural resources) interest of the coastal State, only maintaining the outer limit of the EEZ would be sufficient. If also other factors are deemed important, such as keeping sovereignty over current (land and sea) areas, then maintaining the baselines is necessary. But third States with other interests may be preferring not to have enclaves of territorial sea because of navigational rights in these areas.

The ILA, at the recent Sydney conference, adopted a resolution proposed by the Committee on International Law and Sea Level Rise (Res. 5/2018, 23 August 2018)¹¹³ recommending that coastal and archipelagic States should be allowed to maintain their baselines as well as outer limits. After noting that sea level rise is likely to have a major impact on the coastal features from which maritime zones are measured, causing uncertainties as to the determination of the breadth and extent of the maritime zones in accordance with the law of the sea, as well as possible uncertainties regarding agreed or adjudicated maritime boundaries, the resolution endorsed the views of the committee that any proposals in this area should aim to facilitate orderly relations between States and, ultimately, the avoidance of conflicts, bearing in mind that one of the principal motivations of the LOSC is to contribute to the maintenance of international peace and security. It also endorsed the view that in the formulation of proposals for the progressive development of international law, the dominant considerations should be the need to avoid uncertainty about the extent and limits of maritime zones and location of boundaries and to avoid incentives to artificially preserve baselines physically in order to keep the outer limits of maritime zones.

The resolution emphasizes that the determination of the baselines must have been done in accordance with the provisions of the LOSC, and that they must have been duly published or notified to the Secretary-General of the UN as required by the LOSC.

The implementation of these recommendations of the ILA by coastal States affected by sea level rise would mean that these States adopt a practice which is not in accordance with the current understanding on the interpretation of some of the provisions of the LOSC, either those on baselines and/or those on the maximum

¹¹³ <<http://www.ila-hq.org/index.php/resolutions-passed-at-the-ila-78th-biennial-conference>>.

extent of maritime zones. However, if such practice would consistently be followed by States without objections from other States this practice could become to be regarded either as a generally accepted interpretation of those provisions, or as a modification of those provisions, as will be further discussed in sub-section 5.9.

5.8 Regional State practice

The report of the ILA Committee on Sea Level Rise and International law refers to recent State practice in the Pacific region. On 16 July 2015, seven Polynesian States and Territories signed at Papeete, in Tahiti, the *Taputapuātea Declaration on Climate Change*. This Declaration was made in advance of the Twenty-first Session of the Conference of the Parties to the UN Framework Convention on Climate Change in Paris. It states:

[T]he Polynesian Leaders Group call upon all State Parties to the UNFCCC to
With regard to the loss of territorial integrity:

- Accept that climate change and its adverse impacts are a threat to territorial integrity, security and sovereignty, and in some cases to the very existence of some of our islands because of the submersion of existing land and the regression of our maritime heritage.
- Acknowledge, under the United Nations Convention on the Law of the Sea (UNCLOS), the importance of the Exclusive Economic Zones for Polynesian Island States and Territories whose area is calculated according to emerged lands and permanently establish the baselines in accordance with the UNCLOS, without taking into account sea level rise.¹¹⁴

More recently, in March 2018, eight Pacific island leaders attending the second Leaders' Summit of the Parties to the Nauru Agreement (PNA) signed *The Delap Commitment on Securing Our Common Wealth of Oceans – reshaping the future to take control of the fisheries*.¹¹⁵ The signatories acknowledged the importance of regional co-operation and also acknowledged the challenges presented by their unique vulnerability and the threat to the integrity of maritime boundaries and the existential impacts due to sea level rise. To that end they agreed “to pursue legal recognition of the *defined baselines* established under the United Nations Convention on the Law of the Sea to remain in perpetuity irrespective of the impacts of sea level rise.”¹¹⁶

A practical example from the region is provided by the Republic of the Marshall Islands which on 18 March 2016 passed comprehensive new legislation, repealing

¹¹⁴ Signed by the leaders of French Polynesia, Niue, Cook Islands, Samoa, Tokelau, Tonga and Tuvalu. Text at: <http://www.presidence.pf/files/Polynesian_PACT_EN_15-07-15.pdf>.

¹¹⁵ The Commitment was signed in Majuro in the Marshall Islands on 2 March 2018 by the heads of State or their representatives of The Federated states of Micronesia, Republic of Kiribati, Republic of the Marshall Islands, Republic of Nauru, Republic of Palau, Independent State of Papua New Guinea, Solomon Islands and Tuvalu.

¹¹⁶ *Ibid.*, para. 8; emphasis added.

‘in its entirety’ the 1984 Maritime Zones Declaration Act, and declaring anew all its maritime zones.¹¹⁷ Freestone and Schofield¹¹⁸ have pointed out that this Marshall Islands action represents one of the latest developments in an emerging pattern of practice in the Pacific region whereby States are unilaterally declaring and publicizing their maritime jurisdictional baselines, limits and boundaries. They further concluded that, while stability in the spatial scope of a State’s maritime jurisdiction has clear administrative as well as enforcement benefits, the wider implication of this practice is that it appears to be a deliberate attempt to pre-empt arguments that physical changes to its coastline, particularly those resulting from climate change induced sea level rise, would have resulting impacts on its baselines and/or on the outer limits of its zones. Similar legislation, designating new archipelagic waters and designating the outer limits of the national EEZs has also been passed by Kiribati¹¹⁹ and Tuvalu.¹²⁰

This regional practice started with a strategy document developed by the Pacific Island Forum called the *Framework for a Pacific Oceanscape*,¹²¹ whose Strategic Priority 1 concerns jurisdictional rights and responsibilities. That document urges, in Action 1A, that the Pacific Island Countries and Territories (PICTS) should, ‘in their national interest’, deposit with the UN coordinates and charts delineating their maritime zones. Action 1B, entitled ‘Regional Effort to Fix Baselines and Maritime Boundaries to Ensure the Impact of Climate Change and Sea Level Rise Does Not Result in Reduced Jurisdiction of PICTS’, states explicitly:

Once the maritime boundaries are legally established, the implications of climate change, sea level rise and environmental change on the highly vulnerable baselines that delimit the maritime zones of Pacific Island Countries and Territories should be addressed. This could be a united regional effort that establishes baselines and maritime zones so that areas could not be challenged and reduced due to climate change and sea level rise.¹²²

¹¹⁷ Act No. 13 of 2016. Source at: <http://www.un.org/Depts/los/LEGISLATIONANDTREATIES/PDFFILES/DEPOSIT/mhl_mzn120_2016_1.pdf>.

¹¹⁸ D Freestone and C Schofield, ‘Republic of the Marshall Islands: 2016 Maritime Zones Declaration Act: drawing lines in the sea’ (2016) 31 *International Journal of Marine and Coastal Law*, pp. 720–746.

¹¹⁹ Baselines around the Archipelagos of Kiribati Regulations 2014 (2014), <http://www.un.org/depts/los/LEGISLATIONANDTREATIES/PDFFILES/KIR_2014_archipel_baselines_regulations.pdf>. Also Exclusive Economic Zone Outer Limit Regulations 2014 (2014) (Kiribati), <http://www.un.org/depts/los/LEGISLATIONANDTREATIES/PDFFILES/KIR_2014_eez_outer_limits_regulations.pdf> (Kiribati).

¹²⁰ Declaration of Archipelagic Baselines 2012, LN No. 7 of 2012 (Tuvalu), <http://www.un.org/depts/los/LEGISLATIONANDTREATIES/PDFFILES/tuv_declaration_archipelagic_baselines2012_1.pdf>.

¹²¹ See C Pratt and H Govan, *Our Sea of Islands, Our Livelihoods, Our Oceania. Framework for A Pacific Oceanscape: a catalyst for implementation of ocean policy* (Pacific Islands Forum Secretariat, November 2010), available at: <<http://www.forumsec.org/wp-content/uploads/2018/03/Framework-for-a-Pacific-Oceanscape-2010.pdf>>.

¹²² *Ibid.*, at p. 58.

The Pacific Island States are being supported in these efforts by the Pacific Maritime Boundaries Project. This is a partnership between the Australian Government, regional and international organizations, and academia which is assisting them to negotiate maritime boundary treaties, review and update their maritime zones legislation, and legally establish the outer limits of their maritime zones, and submit and defend their claims to areas of continental shelf beyond 200 nautical miles in accordance with the LOSC.

This regional State practice in the Pacific may, in theory, develop into rules of regional customary international law. The problem with such regional customary international law on a topic as this is that it does not bind States outside the region, unless in their practice and expressed opinions they were to accept the Pacific States' conduct. If such practice is also adopted by States in other regions, and accepted by third States, this could lead to the development of rules of general customary international law which would better suit the topic.

5.9 Future developments and the way forward

Recently, the UN International Law Commission has decided to recommend to the UN General Assembly to include the topic of Sea-level rise in relation to international law in the long-term programme of work of the Commission.¹²³ This decision was taken on the basis of a report by an ad hoc group on this topic, which recommended that a Study Group would be established to explore the different issues raised by the topic, namely law of the sea, statehood and protection of persons affected by sea-level rise.¹²⁴

The establishment of such a Study Group should be welcomed. The ILC will be able to rely on the work of the ILA Committee on Sea Level Rise and International Law and the many publications already available on these topics. Although it can be doubted that many new ideas can be developed, the involvement of the ILC will provide opportunities for debate at the intergovernmental level. In particular, the ILC could suggest conclusions, to be adopted at the intergovernmental level, on such issues as the choice between the options mentioned above of maintaining baselines, or only the outer limits of the EEZ, and the interpretation of Art. 62(2)(a) VCLT as including EEZ and continental shelf boundaries within its scope. The conclusions adopted by the ILC may then be discussed at the UN General Assembly and/or at the Meeting of State Parties to the LOSC. If these bodies endorse these conclusions in some way, and if these indeed support ways to maintain the existing maritime entitlements of coastal and archipelagic States, they will provide support for the practice of States to this effect.

This will then significantly strengthen the authority of this practice as interpretation of the provisions of the LOSC, in accordance with Art. 31(3)(b) VCLT. Since this practice is clearly not in conformity with the text of the relevant provisions of

¹²³ report of the International Law Commission, Seventieth Session (2018), UN Doc. A/73/10, p. 299.

¹²⁴ Annex B to the report of the ILC.

the LOSC, it can be argued that the practice would in fact be a tacit modification of the LOSC.¹²⁵ At the same time, the practice would be constitutive of new rules of customary international law, while in particular any pronouncements by the UN General Assembly or the Meetings of States Parties to LOSC supporting this practice would be evidence of *opinio iuris*. It is submitted that the rules in question are of such a nature that if they are modified as provisions of the LOSC, they should exist in parallel as rules of general customary international law. This means that also the practice of States not parties to the LOSC should be involved.

6. *EXCURSUS*: CONTINUED EXISTENCE OF STATES THREATENED BY SEA LEVEL RISE

This section will briefly deal with the most far-reaching and dramatic potential consequence of sea level rise: the (physical) disappearance/extinction of a State. These issues are outside the field of the law of the sea and belong to the rules of general international law concerning statehood. But since they have attracted considerable attention,¹²⁶ they will be explored briefly.

Although it is not very likely that during this century an island State will completely lose all its territory, it may very well be that all islands have become uninhabitable due to loss of potable water and other necessary conditions for the safe and healthy life of its population, which has resulted in migration or evacuation of all inhabitants. Can a State survive when there are no inhabitants left in its territory?

The generally accepted requirements for existence of a State under general international law include the presence of territory, permanent population, a government that can represent it, as well as sovereignty, i.e. that the entity is not subject to the higher authority of another State.¹²⁷ Thus, if the population is no longer present one of the essential requirements is lacking. In theory there are two options to deal with this situation. One is that the State threatened by sea level rise has timely acquired by a treaty of cession some territory from another State and relocated at least part of its population and its government to that territory. Then that State will without doubt be able to continue its statehood and govern also the depopulated islands. The other option would be that the population is resettled in

¹²⁵ On the possibilities of tacit modification of treaties, see I. Buga, *Modification of treaties by subsequent practice*, Oxford University Press 2018. Specifically on the Law of the Sea Convention: I. Buga, *Between stability and change in the Law of the Sea Convention. Subsequent practice, treaty modification, and regime interaction*, in D.R. Rothwell, A.G. Oude Elferink, K.N. Scott and T. Stephens (eds.), *supra* n. 11, pp. 46-68 .

¹²⁶ See, *inter alia*, R. Rayfuse, International law and disappearing states, *Environmental Policy and Law* 41 (2011), p. 281; J. Grote Stoutenberg, *Disappearing island states in international law*, Brill 2015; A. Torres Camprubi, *Statehood under water: Challenges of sea level rise to the continuity of Pacific Island States*, Brill 2016.

¹²⁷ J. Crawford, *The Creation of States in International Law*, second ed., Oxford University Press 2006, pp. 37-95.

another State which allows the government of the depopulated State to continue governing the remaining (depopulated) territory with its maritime zones, as well as to some extent its people now located on foreign territory. For the viability of this option, much will depend on the recognition of this situation by third States.

Should not only the people have left the islands, but also the islands themselves have disappeared entirely, the situation becomes much more complicated. If the people and government had been moved to another territory acquired by a treaty of cession, and the government continues to govern the former maritime zones generated by the disappeared islands, much will depend on the attitude of third States. It is possible that they will continue to recognize the jurisdiction of the State of the disappeared islands. This will be even more complicated if the government is located on foreign territory and has no territory left of its own. A historical example of such a situation is the eviction by Napoleon of the Sovereign Military Order of St. John of Jerusalem, of Rhodes and of Malta from Malta in 1789. The Order, which exercised sovereignty over the island of Malta, continued to act as a sovereign entity from Italian territory. It still is recognized today by many States as a limited subject of international law, but not as a State.¹²⁸

However, apart from the fact that the situation of a completely disappeared State will not occur soon, it is pure speculation at this stage of how this could be handled. These are very sensitive issues for the peoples involved. Careful consideration is needed, and every situation will be different. In particular, the States concerned may well prefer to use other, traditional, methods to ensure their continued statehood, such as merger with another State, by forming a federation with States in the region in a similar situation at least one of which has territory not threatened by sea level rise.

7. CONCLUDING OBSERVATIONS

The international law of the sea plays a role in both the mitigation of the causes of climate change and the adaptation to its effects. In the area of *mitigation* measures, this role is mainly played by the specialized treaties of the ‘particular’ law of the sea dealing with the various sources of marine pollution, in combination with the rules of reference in the LOSC which may make these rules applicable to all the parties to the LOSC irrespective of the fact that these treaties are not binding for all parties to the LOSC. Examples are the regulation of the emission of GHG by ships, through the MARPOL Convention, and the sub-seabed storage of carbon dioxide, and marine geoengineering involving placement of matter into the sea (in particular iron fertilization) through the LP. The LOSC also fulfils an essential role in that it provides the framework for legislative and enforcement competences by States at sea for these purposes. This framework seems generally adequate, especially since the application of the precautionary approach has resulted in rela-

¹²⁸ Ibid., pp. 231-233.

tively quick responses to emerging issues, and the rules of reference in the LOSC significantly contribute to their effectiveness. Even if they have not yet entered into force, they seem to have an impact on State conduct.

In the area of *adaptation*, the ‘particular’ law of the sea also plays a prominent role. Special treaties dealing with regional fisheries management need to be adapted to the changing circumstances, and new treaties need to be adopted to deal with new issues. An example is the Arctic Ocean where receding ice covered areas will allow fishing activities in the coming decades. The recent adoption of the Arctic Fisheries Agreement, also in implementing the precautionary approach, demonstrates this.

But as far as sea level rise is concerned, the main role is played by the LOSC, since this phenomenon will affect the basic rules for measuring and maintaining the entitlements to maritime spaces, an issue of enormous interest to many coastal States. Considerations of fairness and equity dictate that coastal and archipelagic States affected by sea level rise must be able to maintain their maritime entitlements without having to resort to the (often prohibitive) expenditure of huge amounts of money for artificially maintaining their baselines. However, it is submitted that at the same time the measures to be taken to avoid loss should be available equally to all coastal States. This will also make this approach acceptable to those States that may have other options for maintaining their (most important) baselines. The suggested practice of States affected by sea level rise of not changing their baselines once these have been determined in accordance with the current provisions of the LOSC in order to maintain their current entitlements should be endorsed by the UN General Assembly as well as the Meeting of States Parties to the LOSC, preferably after the ILC has issued a report to this effect. Such practice will result in a tacit modification of the LOSC and new rules of customary international law.

This approach similarly favours interpreting Art. 62(2)(a) VCLT as including maritime boundaries delimiting EEZs, thus safeguarding that maritime boundary treaties will remain in force notwithstanding later significant changes in the location of baselines.

The analysis above of the ways in which ‘technical’ treaties were amended demonstrates the importance of having mechanisms for rapid adoption of new rules in light of changing circumstances. Although the adoption and entry into force of the Paris Agreement demonstrates that even a new treaty can enter into force quite quickly, if the political will is there, treaty provisions allowing the entry into force of adopted amendments and in particular amendments to ‘technical’ annexes should be further promoted. The quick entry into force (100 days after their adoption) of the amendments to the Annex to the LP for regulating sub-seabed storage of carbon dioxide is a case in point. A system of opting-out is preferable to a system of opting in. In this connection it is also worthwhile to point out that even amendments that have been accepted but not yet entered into force can have an impact, since they influence the conduct of States.

In other cases, explanations for the slow entry into force of amendments to ‘technical’ conventions are various: lacking political will, bureaucratic inertia, or lack of adequate resources. These demonstrate the importance of mobilization of public opinion (with a role for NGOs), capacity building, and the role of international and regional organizations (providing support services to national administrations) for this purpose. This means that adequate funding should be made available to these organizations to fulfil this role.

8. PROPOSITIONS AND POINTS FOR DISCUSSION

1. The current international law-making framework provides sufficient mechanisms for the adaptation and development of the law of the sea in response to climate change; its use depends on the political will of States to undertake action.
2. It is unavoidable that an array of specialized treaties as well as the LOSC will be involved in the adaptation and development of the law of the sea in response to climate change; coordination of law-making efforts is therefore essential.
3. As a result of the rules of reference in Part XII of the LOSC, the regulation of GHG emissions from ships in Annex VI MARPOL and the regulation of sub-seabed storage of carbon dioxide and marine geoengineering in the London Protocol, are binding for all parties to the LOSC.
4. All coastal States affected by sea level rise should be allowed to maintain their maritime entitlements as they are or were before sea level rise affects their baselines; this principle should not be limited to special categories of States.
5. From the various options available to implement this policy of coastal States maintaining their maritime entitlements, maintaining the outer limits of the EEZ would offer the best prospects for acceptability as it would entail the least inroads on the general law of the sea rules.
6. A practice of coastal States maintaining their maritime entitlements, combined with endorsing statements from the UN General Assembly and/or Meeting of States Parties to the LOSC, could lead to modification of the provisions of the LOSC and new rules of customary international law.
7. The exception in Art 62(2)(a) VCLT of ‘treaties establishing a boundary’ from the *rebus sic stantibus* (fundamental change of circumstances) rule should be interpreted as including also the boundaries of the EEZ and the continental shelf.
8. An ILC project on Sea Level Rise and International Law should be welcomed.