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Adaptation strategies in deltas and their consequence on maritime baselines according to UNCLOS —the case of Bangladesh and Vietnam

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ABSTRACT

The Mekong delta in Vietnam and the Ganges/Brahmaputra River delta in Bangladesh are likely to be two of the deltas worst affected by climate change in the course of the 21st century. Due to sea level rise, and if significant adaptation measures are not taken, large areas of these low-lying coastlines could eventually become submerged. This paper will explore some of the consequences that climate change and sea level rise can have on maritime baselines and deltaic areas, according to publicized charts by the States involved and to the United Nations Convention on the Law of the Sea (UNCLOS). The study will argue that although great changes are likely to take place at the geographical level, due to the complex geomorphological nature of deltas and how they will be affected by sea level rise, these will not necessarily translate into changes in maritime baselines and the classification of these areas according to UNCLOS. Furthermore, other forms of adaptation to sea level rise, such as the construction of coastal defences, could turn the Mekong and Ganges/Brahmaputra River deltas into “polders”, with similar characteristics and problems as the Netherlands nowadays.

1. Introduction

Climate change and sea level rise arguably represent two of the major challenges for the Mekong delta in Vietnam and the Ganges/Brahmaputra delta in Bangladesh, which are likely to be two of the areas worst affected by climate change during the course of the 21st century. Due to sea level rise, and if significant adaptation measures are not taken, large areas of these low-lying coastlines could become submerged in the future. The present research will examine some of the possible consequences that sea level rise and climate change could have on deltaic areas and analyse what are the consequences for the status of maritime baselines and coastal areas. The authors will analyse publicized charts by the States involved and interpret them according to the United Nations Convention on the Law of the Sea (UNCLOS) and expected consequences of climate change and sea level rise outlined in the Intergovernmental Panel on Climate Change 5th Assessment Report (IPCC 5AR). Particular emphasis will be placed on Article 7 of UNCLOS, which provides the regime of deltas, a provision that was originally drafted in response to Bangladesh's particular geographical characteristics.

The paper will argue that although great changes are likely to take place at the geographical level, due to the complex geomorphological nature of deltas and how they will be affected by sea level rise, these will not necessarily translate into changes in maritime baselines and classification of these areas according to UNCLOS. Geography is not the only factor which defines baselines in each of these countries. National interests also play a major role since there are a number of abusive claims related to straight baselines in East Asian countries (Bateman and Schofield, 2008). Other forms of adaptation to sea level rise, such as the construction of coastal defences, could turn the Mekong and Ganges/Brahmaputra River deltas into an area with similar characteristics and problems as the Netherlands nowadays. Essentially, it would transform the areas from being natural geomorphological ecosystems to managed landscapes where water bodies inside them would have to be carefully maintained, ensuring adequate drainage and the protection of the sea/land interface through a variety of coastal defence schemes (such as sand dunes and

Abbreviations: AR5, 5th Assessment Report; ICJ, International Court of Justice; IPCC, International Panel on Climate Change; LPDR, Laos People's Democratic Republic; UNCLOS, United Nations Convention on the Law of the Sea.

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dykes). If such adaptation measures are not attempted, it is possible that large sections of the deltas will be inundated, in a manner similar to what appears to have happened to the area known as Doggerland in the North Sea thousands of years ago. If so, then the inhabitants of the delta might be forced to migrate, an adaptation strategy of last resort.

Possible adaptation strategies will be discussed, together with the consequences that they could have on the classification of each area. The main objective of the paper is to try to understand what would be the consequences regarding the baselines that are currently claimed by each country. While the authors will briefly discuss whether such claims are actually appropriate under UNCLOS, a detailed discussion on this issue is outside the scope of this paper. Thus, the paper attempts to highlight the consequences to the classification of coastal areas and maritime zones for the Mekong and Ganges/Brahmaputra deltas under the present logic of the claims of each of the two countries, who presently exercise sovereignty over the delta. The research will provide important insights into future problems that will arise from circumstances that were unforeseen when UNCLOS was drafted, namely the significant alterations of the world's coastlines that could result as a consequence of sea level rise. While provisions were made in this treaty for small movements in the coastline of deltaic areas, those involved in its elaboration failed to realize the rather dramatic alterations that could take place if sea levels were to rise by several metres. Such problems could not only lead to the migration of those currently living in those areas, but also significantly affect crop output and destroy local ecosystems, significantly impacting on the provision of ecosystem services. Finally, it could eventually create a significant gap between political and geographical maps, with countries referring to maps decades or centuries old to make future claims on geographical features.

2. Climate change and deltas

The link between human activities and the increase in global temperatures is an issue that very few people question these days, and has been enshrined in a wide body of scientific literature that was last summarized in the 5th Report of the International Panel on Climate Change (or IPCC 5AR, 2013). This report highlights how the concentration of greenhouse gas emissions in the atmosphere is nearly double than that of pre-industrial levels and is still rising. It is feared that in the coming years the increasing levels of CO_2 concentrations in the atmosphere will accelerate the pace of global warming. For countries such as Vietnam or Bangladesh this could manifest itself in an acceleration in the pace of sea level rise, resulting in the flooding of cities situated in coastal areas, agricultural fields and increasing the levels of coastal erosion, with disastrous consequences for their inhabitants. Particularly important is the problem faced by the major deltaic areas in both of these countries. Deltas are low-lying coastal platforms formed by the accumulation of riverine sediments in the areas around river-mouths, mostly during the last 6000–8000 years of relatively stable sea levels. They are extremely sensitive to changes in sea level (IPCC 5AR, 2013), and can experience a number of natural hazards such as river floods and tropical cyclone storm surges. Several of the predicted impacts of climate change in these areas will be analysed in the next section.

2.1. Sea level rise

The two main contributors to sea level rise in the 20th century are ocean thermal expansion, which essentially means that water expands in volume when it becomes warmer, and glacier melting (IPCC 5AR, other causes include the melting of polar ice caps and ice loss from Greenland and West Antarctica). Satellite information available since the early 1990's indicates that global sea levels have been rising at around 3 mm per year, a rate significantly higher than during the previous half a century (where sea levels were raising at around 1.7 mm per year). The rate of increase is not constant for different regions, and from an economic, engineering and social point of view the most important factor is the regional increase in sea levels, which could differ significantly from the global average (Magnan et al., 2011). Currently, for the case of Vietnam it appears that sea level rise follows closely that of the rest of the world, at around 1.75–2.56 mm/year (Thi Thuy and Furukawa, 2007). Sea level rise in the country is unlikely to be uniform, and would be highest in the region from Ca Mau to Kien Giang (62–82 cm by 2100, according to MONRE, 2012 scenarios, see Ngo-Duc, 2014), and would be lowest from Mong Cai to Hon Dau (49–64 cm).

As at present CO_2 emissions continue to increase it appears likely that the planet will continue to warm and thus that a significant amount of sea level rise is inevitable, unless drastic action is taken to reduce emissions. According to the IPCC 5AR (2013), it is believed that sea level is likely to rise in the range of 26 and 82 cm by 2100, substantially higher than the 18 and 59 cm projection given in the IPCC 4AR. This is due to the fact that more data on ice loss has been collected, and there has been more research on how ice sheets react to climate change, which improved the modelling of thermal expansion. In fact the IPCC 4AR (2007) assumed that ice was accumulating over the Antarctic ice sheet, though it appears to be currently losing mass as a consequence of dynamical processes, as shown in Allison et al. (2009). Recent research such as that by Vermeer and Rahmstorf (2009) indicate that for the future global temperatures scenarios given in the IPCC 4AR projected sea level rise for the period 1990–2100 could be in the 0.75–1.9 m range. Such levels would result in serious consequences to certain areas of the world, flooding millions of people living in the low lying areas of South, South-East and East Asia (Stern, 2007). Even under a conservative scenario of only 40 cm increase in sea level by the end of the 21st century this would increase the projected number of people flooded in coastal areas from 13 to 94 m (Wassmann, 2004). The consequences of sea level rise would thus be felt by most nations on Earth, though they would be more severe to those inhabiting deltaic areas, such as the Mekong or the Ganges/Brahmaputra deltas (IPCC 5AR).

The Mekong delta, for instance, is a complex sedimentary environment that resulted from the deposition of sands and silts carried from the upper reaches of the Mekong. Its present morphology developed during the last 6000 years, when the delta advanced around 200 km over the continental shelf of the East Sea (Mekong River Commission, 2010). Prior to this time in the early Holocene sea levels rose rapidly following the end of the last ice age 19,000 years ago to reach a level of 4.5 m above present levels (Mekong River Commission, 2010). At this time the shoreline of East Sea reached Phnom Penh in present Cambodia (Mekong River Commission, 2010), and raising sea levels could eventually bring it back there if significant adaptation strategies are not implemented. Already at present around 1.7 m ha of land is flooded every year, affecting 9 million people (ThiThuy and Furukawa, 2007), which is no longer limited to a narrow band of land next to the coastline but extends into the inland regions. To a certain extent, local residents have learnt to live with this flooding (Takagi et al., 2014a, c), and many do not seem to consider it a pressing danger. Actually, much of the flooding is caused by increased water discharge in the Mekong, coinciding with high tides (Takagi