The North Sea coastal plains over the last two millennia: landscapes or seascapes? A new collection of essays.

The goal of the book

This volume is, to a large extent, the result of a gathering organised by its editors in Ghent, which took place April 22-24, 2010, and dealt with the geographical evolution of the coastal areas adjacent to the North Sea, with a focus upon the last two thousand years. This conference was actually the third in a series of symposiums on the same broad theme. The first took place more than fifty years ago, in 1958, and the second in 1978. However, the recent gathering differed from the previous two in one principal way: it was not limited to the Low Countries alone but included other countries in the North Sea area such as Scotland, England and Germany, and also northern Italy. Recognized specialists were invited to present their research in a variety of fields relating to the subject at hand, and this book represents their work.

Our purpose in amassing and presenting the 'state of the art' in this volume is to stimulate future investigations. In addition, the various disciplines in which the coastal plains are studied too often remain within their own borders, and so we have set out to thoroughly interweave them in the hope that this will spur greater interdisciplinary cooperation. All of the texts contained herein underwent a process of peer review and editorial oversight in order to ensure quality and readability because this collection is intended to appeal not just to experts in historical geography, but to historians and scientists working in any field who wish to gain insights into the present 'state of play'. With that in mind, specialist terminology has been simplified on the editors' discretion in order to facilitate cross-disciplinary understanding and research.

The genesis of this volume

The first, rather modest, symposium in 1958 was the initiative of two soil scientists working at the University of Ghent, R. Tavernier and J. Ameryckx. Combining their latest findings regarding different chronological deposits, with the new research by their Dutch colleagues, C.H. Edelman and J. Bakker, they proposed that there were successive changes in the level of the North Sea during the Holocene period, although the precise dates of these fluctuations were, as yet, unknown. In order to try and track this evolution through the historical era, Tavernier enlisted the help of the historian Jan Dhondt, also from the University of Ghent, who co-organized the conference. In turn, Dhondt inspired another co-worker and historian, Adriaan Verhulst, to compare the soil scientists' results with historical source material and the literature by Dutch colleagues such as S.J. Fockema Andreae, J.F. Niermeyer, and E. Gottschalk. Verhulst added further to the conversation by involving archaeologists and place-name specialists, such as Maurits Gysseling.

The dating of the deposits in what were believed to be alternating phases of 'transgression' and 'regressions' in sea level, called 'Calais' or 'Dunkirk' for the pre-historic and historic periods respectively, were at the heart of these thought-provoking discussions.

However, the results of the workshop were only published at a regional level[1]. And while many unexplored written sources in both Belgium and the Netherlands were thought to contain information that could lead to a more accurate chronology of these sea level changes in coastal evolution, many questions and uncertainties remained. It was already clear, for example, that the theories promoted by the soil scientists had been applied too indiscriminately.

However, it took another twenty years before a second conference was held. This took place in 1978, and was the initiative of Verhulst of Ghent University and Elisabeth Gottschalk of the University of Amsterdam[2]. Another meeting was essential because of the huge advances in research made during the previous two decades. First, it had become clear that soil scientists, historians, and archaeologists could not simply use each other's data to support their own chronologies and interpretations of coastal geomorphology. Historical investigations had concluded that the direct causes of large scale flooding in the south-west Netherlands were primarily individual storm surges, rather than Dunkirk-transgressions, as had been assumed. Even though the underlying reasons remained unknown, by 1977 a reliable chronology of storm surge events had been established[3].

For their part, archaeologists had demonstrated that the transgression-regression cycle needed to be delineated from mean sea level rise; earth scientists, thanks to many new techniques allowing them to greatly increase their knowledge of long and short term coastal sea level evolutions, had shown that this had drastically slowed from *c*.1000 BC onwards. Historical climatology also entered the fray, as attempts were made to associate storm surges with warmer climatic periods[4], this way re-introducing in fact short term changes in sea level to the debate. In addition to which, the 1978 conference strongly appealed for more investigation of the so-called 'Dark Ages', the period prior to 1000 AD, primarily because archaeological research was not yet able to confirm human occupation of the coastal plain between the fourth and tenth centuries. The lack of evidence was regarded as an *argumentum ex nihilo* in support of the hypothesis that the early medieval coastal plain was almost entirely abandoned during that period because of large scale flooding.

To summarize: in 1987, apart for essays to adapt their chronology, there was a growing interest in the underlying reasons for different stages of occupation and reclamation. However, many of the conference's participants left rather unsatisfied; particularly with regards to the duration and nature of phases in coastal plain evolution because one of the primary outcomes of the symposium was a growing scepticism towards simplistic patterns and phases of transgressions and regressions. From that point onwards, these concepts lost all meaning for many researchers. Nevertheless, a small minority of specialists, and many non-specialists, persisted in this approach and are still using its terminology to this day[5].

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[1] Ameryckx, J. and Verhulst, A. (1958) 'Enkele historisch-geografische problemen in verband met de oudste geschiedenis van de Vlaamse kustvlakte. Een colloquium van bodemkundigen en historici', *Handelingen der Maatschappij voor Geschiedenis en Oudheidkunde te Gent*, 12, pp. 1-24.

[2] Verhulst, A.E. and Gottschalk, M.K.E (1980) *Transgressies en occupatiegeschiedenis in de kustgebieden van België en Nederland*, Gent (Belgisch Centrum voor Landelijke Geschiedenis; 66).

[3] Gottschalk, M.K.E. (1971-1977) *Stormvloeden en rivieroverstromingen in Nederland*, 3 vols, Assen.

[4] Lamb, H.H. (1980) Climatic fluctuations in historical times and their connexion with transgressions of the sea, storm floods and other coastal changes, in: A. Verhulst en M.K.E. Gottschalk (eds), *Transgressies en occupatiegeschiedenis*, pp. 251-290.

[5] For more details regarding the recent research by earth scientists in particular, see Baeteman, this volume.

The three decades following the second conference have yielded a wealth of knowledge from an ever-expanding body of research. Many of the issues then raised in 1978 have since been addressed, but only through the salutary dispersal of investigations across even more disciplines. Above all, the latest research on deposits was incorporated into attempts to explain coastal phenomena in a more profound and nuanced way than ever before. Detailed soil sampling in many areas provided new data, with peat layers proving to be especially excellent materials for pollen analysis and radiocarbon dating. By using such methods, researchers gradually gained a better understanding of the close relationship between the processes of deposition, sea-level change, and land formation taking place across multiple regions. In particular, earth scientists increasingly came to realize that the formation and loss of land in coastal environments must be understood as the result of the complex interplay of many natural mechanisms. Furthermore, we now know that during the last millennia of the Holocene, semi-long-term small-scale changes in the absolute sea level (formerly incorrectly called 'transgressions' or 'regressions') either did not occur or were so subtle as to be immeasurable[6], while regional land loss and gain occurred widely but on different temporal and spatial scales, and resulted in local, *relative* changes in sea level.

Historical and archaeological research also evolved during this time. Most significantly, ideas regarding the chronology of human occupation have changed, and since 1978 we have become much better informed on this aspect of the 'Dark Ages'. This has been achieved through the combined efforts of archaeologists, historical geographers, and place name specialists. Generally speaking, current research into the Roman occupation demonstrates that there was a much denser population than previously thought, while the Early Middle Ages witnessed a decline in occupation. Thereafter, from the Carolingian period onwards, there was a clear revival in the population density of many coastal areas. Indeed, the eleventh and twelfth centuries show an increase in population and settlement, the very same era previously believed to have had higher sea levels[7].

Until about the twelfth century AD, it appears that, until the twelfth century, there was overall relatively little divergence between the levels of occupation in coastal areas and the majority of 'inland' areas in the Low Countries and Western Europe, and this despite regional and local variations due to drainage problems near the coast. However, this changed starting in the thirteenth century. New research on what followed indicates that the coasts were suffering the consequences of long-term over-exploitation. Some of the articles in this book explore this theme and demonstrate that after a period of intensive cultivation, an ever-increasing effort was required in order to work coastal regions, thereby pushing many farmers into commercial production. This line of investigation demonstrates how historians have recently increasingly taken social structures into account when explaining coastal geographical changes and local evolutions.

Facilitating further research

Despite the progress made in the last few decades, much remained to be investigated. The findings of earth scientists, historians, and archaeologists were not widely reported on within

[6] For a summary of the most important natural processes influencing *relative* sea level changes, see Weerts, this volume.

[7] At one time, the eleventh century was thought to have seen a third "Dunkirk transgression", and the presumed general flooding was supposed to have been linked to semi-long-term small-scale changes in the absolute sea level.

their respective circles. One of the purposes of the 2010 conference was to foster *an improvement in the mutual knowledge of different disciplines*, and it succeeded. As a result of this gathering, and the research presented here, we now know that while many studies have underlined the importance of 'accommodation space' in mitigating the risks of flooding, this margin has been heavily influenced by man made changes to the environment. Many, for example, underlined the importance and scale of peat compaction as a result of peoples' activities, the consequences of which were flooding, long-term land loss, and an increase in 'accommodation space'. Others focussed on the role of the human impacted hinterland in sediment transport and drainage into the open sea, together with the opening up of inlets. Still others drew attention to how the process of dike building carried with it an increased risk of flooding.

This scope of the research collected in this volume is also important because it has increasingly become evident that land loss and gain were the results of *regional factors.* Moreover, it is now clear that humans devised survival strategies, and thus organized their activities in relation to the environment, on a regional basis, which means that the causes of local changes must have been both natural and socio-historical[8]. The two were interwoven. Yet recent investigations, and many of the articles presented here, stress that the human factor is still largely underestimated in the history of coastal landscapes; this is probably to a large extent responsible for the fact that the last two to three thousand years of the Holocene are referred to as a 'period of instability' by Martyn Waller. While we may still misjudge this element in relation to the pre-Roman era, the activities of mankind were hugely influential during the Roman period and increased further after the seventh and eighth centuries.

It has now become clearer than ever that there is no single chronological scheme capable of explaining the coastal evolution across the entirety of the North Sea area. Earth scientists have shown that there was a very small, gradual, relative rise in level of the southern portion of the North Sea during the last millennia, although this change differed from one area to another. Semi-short-term fluctuations over decades or centuries, the so-called 'transgressions' and 'regressions', have now been completely disproven, and cannot have been the cause of periods of changed marine influence in an area. As was underlined many years ago by Baeteman, Vos, Weerts, Waller and others, there is no evidence for it in the Late-Holocene stratigraphy; nor, as Tys, Agustyn, Henderikx, Borger and others have shown, is there any indication of it in the archaeological and historical data. The same is true for storm surges; although they did bring about some alterations, their influence was varied too much by locale to have been decisive or explicative.

Yet, the dismissal of an overall pattern of natural change, does not rule out the changed importance of human influence on a regional scale, as highlighted by Rippon.[9] Indeed, instead of natural, successive phases of transgressions and regressions, sea-level fluctuations in other words, coastal land loss and land gain were likely caused by *social cycles*, as Otto Knottnerus aptly dubbed them at the conference. Schematically one can discern four stages in such a cycle:
Stage 1: initial, 'low impact' exploitation and modification the natural environment.
Stage 2: transformation of the natural environment into a cultural environment via increased colonisation and more intensive land use.

[8] See Thoen, this volume.
[9] See Rippon, this volume.

Stage 3: accumulative environmental adaptation through extensive alterations. Overexploitation subsequently often led to environmental problems including land subsidence and higher water levels in the estuaries due to the embankment of adjacent saltmarshes.
Stage 4: resulting, at times, in the abandonment of land and occupation sites and the emergence of new natural environmental conditions. This could lead back to stage one.

Interestingly, this pattern of human behaviour in marine areas shows similarities with Malthusian cycles. However, just as the Malthusian model cannot be applied everywhere in the same fashion, the four-stage schema, as it is described above, also has its limitations. These phases did not occur everywhere in the same fashion, or with the same negative consequences. Indeed, to explain regional differences one must also take into account the different social structures of regionally organised rural societies, or *social agro-systems*[10], which to a large extent determined the sustainability of (coastal) areas.

Moreover, it seems that there were both *cumulative* and *lateral spatial* effects. This means that local phenomena, such as overexploitation or problems arising from drainage issues, in one area could have had a huge influence on an adjacent area in the same period, or further down the road. In his article, Henk Weerts demonstrates that coastal land gain or land loss differed both regionally and temporally; while in his, Dirk Meier shows how locale specific alterations to creek systems changed the surrounding environment. Poor maintenance of dike and drainage infrastructure could also cause problems in adjacent areas. At the same time, however, a disastrous loss of land on one side of an estuary could mean safety for the other side for centuries to come.

The book underscores the limits of current research in an effort to stimulate future investigations to fill some of the lacunas. While we currently have a vague picture of the most important natural and human influences on changes in marine areas and how they function, it is clear that we still have not undertaken enough regional studies either to fully understand the interplay of the factors at work, or to explain the underlying mechanisms of change. Some periods clearly deserve more research, such as that spanning the third and the seventh centuries AD. There is also still much to study regarding infrastructure, water management in general, the reclamation of peat areas and wetlands, and land use, of the dunes for example. Not to mention the techniques used to make alterations, the social organisations and administrations, and the settlement structures. We also need to improve our ability to measure the physical effects of such changes, like land subsidence. Despite the deeper insights afforded us by research undertaken over the last few decades, our models are still to some extent based on fragmented documentation in several areas.

Finally, we must ask ourselves how past societies responded to environmental changes or challenges and in what way these impacted social relations among different coastal regions. Finding answers to these questions could aid us in dealing with current ecological transformations. They touch upon recent global discussions regarding flooding hazards in terms of how societies and governments respond to this issue, effectively or otherwise. At the dawn of the twenty-first century, the belief in our ability to find technological, 'sustainable' solutions for countering hazards such as coastal flooding has waned. 'Environmental risk' is itself increasingly seen as a cultural concept, highly dependent upon time and place specific relations of power and property. Fully interdisciplinary studies of the marine landscapes

[10] See Thoen, this volume, p. XXX.

around the North Sea, undertaken by extensive teams of researchers, are necessary for understanding the evolution of these coastal areas, both in the past and in the future.

Outline

The book is split into two parts. The first focuses on the influence of natural phenomena on coastal evolution and closes with an article by Weerts, which provides a general literature review of our present state of knowledge regarding these occurrences, including natural processes unintentionally triggered by mankind. The second discusses direct human influence upon the evolution of the coastal areas and finishes with a general overview from Thoen of the most up-to-date literature on the subject. We have refrained from providing an overall synthesis for the entire North Sea area, primarily because the research conducted thus far has been too fragmentary to allow it. Maybe – hopefully - this will be possible after the next conference, although we certainly do not want to wait another twenty or thirty years for that happen!

Acknowledgements

Since this volume is not a 'classical' publication of conference proceedings but rather a collection of restyled, peer reviewed, and extended articles with quite a few illustrations, it required a great deal of nuts and bolts attention to detail. This was carried out primarily through the initiative of dra. Lies Vervaet, an assistant in the Department of History of Ghent University, and co-editor of this book. She organized the peer reviewing process, which was performed with the help of both the Flanders-Netherlands publishing team and specialist colleagues. We are also grateful to Bart De Wit, of the University of Ghent, who painstakingly reformatted many of the illustrations, as well as to dr. Alasdair Ross, Senior Lecturer in Environmental and Medieval History at University of Stirling, who proved the ideal native English speaker for correcting the language in the texts.

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FIGURE 1.1