

BOOK REVIEW

Gerd MASSELINK & Roland GEHRELS (Eds), 2014. **Coastal Environments & Global Change**. American Geophysical Union – Wiley. ISBN 978-0-470-65660-0. Hardcover, 448 p. Price € 112.50

Gerd Masselink and Roland Gehrels have assembled a collection of papers that address the most important drivers of coastal evolution, because they have affected coastal processes and landforms during the Quaternary. However, the editors do not argue why the title includes global change or specify the latter. The processes of coastal change and the dynamics acting on the coast are timeless.

The volume consists of 16 chapters written by 23 authors preceded by an overview paper by the editors. The overview paper presents the theoretical framework and the scope of the book. The focus of the book is to provide a description of the various coastal environments including their functioning and governing processes, and also to evaluate how they might be affected by global change and how coastal management may assist in dealing with coastal problems arising from climate change.

In the chapter 'Sea Level' **Glenn A. Milne** introduces the fundamental concepts and observational techniques required to understand sea-level changes at a variety of temporal and spatial scales. This chapter presents sea-level change through the Quaternary, considers instrumented sea-level records and ends with a brief description of sea-level projections for the future. In 'Environmental Control: Geology and Sediments' **Edward J. Anthony** describes the current knowledge of setting boundary conditions for coasts, considering the overall tectonic framework, lithology, influence of sediment storage and redistribution in the coastal zone under the influence of coastal processes. Waves and tides, the physical drivers that provide the energy for essentially all changes in coastal geomorphology, are analyzed and synthesized by **Daniel C. Conley** in the chapter 'Drivers: Waves and Tides'. This paper is not a particularly easy-reading one. In 'Coastal Hazards: Storms and Tsunamis' **Adam D. Switzer** compiles the basic knowledge about extra-tropical storms, tropical cyclones and tsunamis with emphasis on the vulnerability of coastal communities and infrastructure, and how increased understanding of the causes, properties and structure of storms can be used to reduce risks.

With the first series of 4 chapters all driving forces affecting coastal environments are addressed. However, apart from the sea-level chapter, they do not specify global change. Each chapter ends with a brief part about effects of global change, but the impact is described generally and vaguely, and addressed in terms of most likely, suggested or possible changes.

A subject rarely covered in literature on changing coastal environments is 'Coastal Groundwater', which is well documented by **William P. Anderson** in a dynamic context.

The following 10 chapters address the major coastal environments. In the chapter 'Beaches' **Gerben Ruessink & Roshanka Ranasinghe** discuss sandy, wave-dominated, open beaches, including the nearshore zone. The authors consider the wave-driven processes, morphology and sediment transport, impact of accelerated sea level, changes in magnitude and number of severe storms, and coastal management. **Karl F. Nordstrom** discusses the evolving nature of 'Coastal Dunes' and the role of human actions. An important and must-read paper by **Sytze Van Heteren** 'Barrier Systems' covers almost all aspects of barrier systems (the environment, formation, behaviour and development with their multiple drivers, and numerical and conceptual models necessary for a further perspective). The shoreface is also addressed in this chapter. 'Tidal Flats and Salt Marshes' are synthesized by **Kerrylee Rogers & Colin D. Woodroffe**. It is

somewhat surprising to see a chapter on tidal flats without any reference to the classical papers (apart from Evans, 1965; Davis & Dalrymple, 2012 is not mentioned in the list of key publications). Moreover, only the intertidal mudflat is considered. Here it is clear that the appropriate and relevant reference works have not been used (but *Encyclopedia of Coastal Science* has, leading to erroneous descriptions, e.g. bubble structures in mud; or: "the sediment in the tidal flat supporting a rich organic community is less reworked than the biotically poorer sandy environments"). The sand flat and the subtidal environments are not considered. Tidal channels are very briefly mentioned, however, in the part that describes 'Mud dynamics'. The distinction between creeks and tidal channels is not made, because creeks do not migrate across the mid and low tidal flats, tidal channels do. Creeks are restricted to the salt marsh. The parts about 'Sediments & Sedimentology' and 'Sedimentary structures' are very weak. One has to wait for the part about 'Mud dynamics' to read about the so typical tidal bedding and tidal bundles whereby one of the major items -reversal of the currents- is not mentioned. The 'Salt Marshes' on the other hand are better served, but mainly considered in the context of ecosystems and their response to sea-level change, and hence, meet the scope of the book. **Colin D. Woodroffe, Catherine E. Loveluck & Kerrylee Rodgers** present 'Mangrove Shorelines'; the latter term is somewhat surprising because the chapter is dealing with mangrove forests sometimes occupying large intertidal areas. This chapter gives a comprehensive overview and critical discussion of the most relevant aspects, such as zonation and succession (in a stratigraphic context), geomorphological setting and ecosystem functioning, sedimentation and morphodynamic feedback, mangrove response to sea-level change (with a short description of the Holocene evolution in northern Australia), human influences, impact of storms, and finally impact of future climate and sea-level change. A synthesis of the major aspects of estuaries is given by **Duncan Fitzgerald, Ioannes Georgiou & Michael Miner** in the chapter 'Estuaries and Tidal Inlets' including a part about the impact of global warming, atmospheric circulation and rising sea level. The wide range in tidal-inlet settings is described in a much more elaborated manner, documenting morphodynamics, formation and evolution, tidal-inlet relationships, sand transport patterns, effects on adjacent shorelines, human influence, inlet fill sequences and response to sea-level rise. The chapter about 'Deltas' by **Edward J. Anthony** is also a must-read paper. It documents almost all aspects of their extremely diverse morphology, also including depositional processes, depositional history, syn-sedimentary deformation, and the strong influence by humans. Moreover, it is an easy-reading one and the literature referred to is recent. **Aart Kroon** discusses 'High-Latitude Coasts', which are rarely covered in classical handbooks. The freezing temperatures and the impact of ice and snow make the polar coastal environments unique and different from those in temperate zones and in the tropics. Global changes in climate induce many changes on these coasts, which have also a special sea-level history mainly due to isostatic uplift. The particular ice-related processes and coastal responses, and the impact of climate change are well documented for the Arctic region. **Wayne Stephenson** addresses 'Rock Coasts' that occupy 80% of the world's shoreline. He documents the processes acting on rock coasts, and the different landforms, which are illustrated with numerous photographs. An attempt is proposed to make a morphodynamic model to understand the development of rock coasts over long timescales. The last chapter describing coastal environments is about 'Coral Reefs' by **Paul Kench** focusing on the geomorphology of reef systems including the relationship between ecological and physical processes, the formation and controls on development of coral reef platforms. The management

of coral reef landforms and the geomorphic implications of global environmental change are also examined.

The very last chapter of the book is about 'Coping with Coastal Change' by **Robert J. Nicholls, Marcel J.F. Stive & Richard S.J. Tol**. Here the coasts are considered in the context of the most densely populated and economically active land areas on Earth. The effect of sea-level rise is recalled as well as land subsidence due to drainage and withdrawal of groundwater and/or fluids. Mitigation and adaptation as responses to coastal change are addressed, however, without new emerging ideas.

A chapter on sabkhas would have been welcome to complete the overview of coastal environments. Sabkhas are now very briefly mentioned in the chapter about intertidal flats. Although the editors state in their introduction that the long-term perspective has to be considered, because the contemporary coastal landscape is partly a product of processes and landforms in the past, most of the chapters are restricted to a description of the geomorphology and superficial characteristics. A presentation of sedimentary sequences produced by the driving forces would have given greater value to the book.

Most chapters include Concept Boxes with further details about a particular subject. The book is well illustrated with numerous line drawings, schematical diagrams (mostly previously published) and photographs. A series of coloured plates is also included. The Subject and Geographical Index are adequate and

each chapter contains a summary, a short list of key publications with a brief but concise explanatory note (except the one on estuaries and tidal inlets) and an elaborated reference list. As negative note, it must be said that some publications referred to are not in the reference lists (and in particular those of Masselink) and the references are not cited similarly throughout the book. A companion website accompanies the book. The website includes Powerpoints of all figures from the book for downloading and PDFs of tables from the book.

On balance, this book is a useful compilation of the driving forces acting on coasts followed by the geomorphological description of almost all coastal environments. Geography and geomorphology graduate students will find the book to be good background.

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