

SHORELINE MANAGEMENT GUIDELINES

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《海岸线管理实用手册》

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前言

《海岸线管理实用手册》是一本关于海岸地貌和海岸线管理的实用手册，让您对当前的海岸地貌及海岸线管理问题有一个基本了解，对于海岸防护并没有太多涉及。我们尽可能地让本书适合于从事海岸地貌和海岸线管理的专业人员或兴趣爱好者阅读，包括私募机构、规划部门、政府部门以及技术工程师等。

本版《海岸线管理实用手册》为第四版，首版出版于2001年。本次修订增加了气候变化对海岸的影响，以及如何适应这些变化的最优解决方案。

国际航运协会曾于2014年出版了《转型期国家：海岸侵蚀减缓准则》一书。该书大部分的灵感来自于2004版的《海岸线管理实用手册》，当然也涵盖了其他新的内容。而在2004版基础上修订的新版《海岸线管理实用手册》，也大量参考了国际航运协会2014年第123的报告，同样的也包括了很新很多的资料和信息。

对海岸带管理最具影响性的气候变化参数是海平面上升，而风暴灾害增多也加剧了海岸线的变化。

海平面上升对海岸主要有两个影响：

- 1) 海岸低洼地区洪灾风险加剧。作为自然灾害的一种，洪水可能在极短时间内造成大面积的影响；
- 2) 海岸侵蚀风险加剧。海岸侵蚀将随着海平面上升日趋严重。

《海岸线管理实用手册》在筹备和出版过程中，得到了丹麦科学创新中心与高等教育部下属的丹麦战略研究理事会的大力支持。

丹麦赫斯霍尔姆
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1 Background

Coastal engineers, planners, administrators, private landowners and politicians should have a common basis as background for planning sustainable human activities along the coasts. In particular the following issues are important:

- coastal processes
- goals for management strategies
- management possibilities and solutions
- adaptation to climate changes

These subjects have been dealt with in numerous textbooks and scientific papers; however these media are not easily accessible to planners, decision-makers and other interested parties, as most of these publications are written and read mainly by researchers. Many of the textbooks are too scientific and too voluminous (and thus time-consuming) for non-specialists to access, and many of the papers are very specialised, either as regards scientific topic or geographical setting. Furthermore, they are published in conference proceedings and journals, which are not - and should not be - standard references for planners and decision-makers.

Most of the required knowledge is therefore only available to specialists. However, the authorities make decisions concerning shoreline management based on their understanding of the subject. Consequently it is the responsibility of scientists and engineers to communicate their knowledge to the public so that it is easily understood.

The recipients of this knowledge are:

- The landowners facing the problems, who often are the main contributor for financing coast protection schemes
- The authorities responsible for planning and approval of shoreline management schemes
- Consulting engineers, who are responsible for designing shoreline management schemes
- The decision-makers, public officers and politicians

Shoreline Management Guidelines aims to fill the gap between the professional coastal scientific community on one side and the above mentioned parties on the other. It offers a relatively short but scientifically correct guide to:

- coastal processes
- holistic management concepts
- environmentally sound shoreline management interventions
- coastal adaptation to climate changes
- up to date investigation methodology

1.1 What are the problems - and how to address them

The problem we face is the accelerating number of conflicts between development on the coast and coastal erosion/coastal flooding; these conflicts are further aggravated by the climate changes. The development pressure on land in combination with the progressing coastal erosion leads to requirements for coast protection, and in many cases subsequent deterioration of our shores. There are many reasons why most coastal regions throughout the world suffer from these problems despite the high level of coastal engineering and the science of coastal processes available today.

Many human activities deprive our shores of a natural supply of sand, such as river regulation works - often far away from the coast – and sand mining in rivers. In addition, the construction of harbours, inlet regulation jetties, maintenance dredging, hard coast protection works and the ongoing Sea Level Rise, all add to the problem. With less sand available our formerly natural and stable sandy beaches will suffer from erosion.

Lack of sustainable planning has, in many cases, permitted urbanisation and infrastructures too close to eroding coastlines, which has aggravated the consequences of chronic erosion. Nowadays, most countries have a legislation, which enforces restrictions on construction activities near the coastline and forces project developers to perform impact assessment studies for coastal projects and to implement remedial measures as part of the project if negative impacts are identified. In most cases there is also nature protection legislation, which promotes sustainable development through requirements to re-establishment of recreational beaches and requirements to preservation of natural beaches. The main problem is that there is normally no budget for fulfilling the requirements to re-establishment and preservation of the coastal resources (sandy beaches).

The climate changes are global problems, which will cause a general Sea Level Rise in the future and which will add to coastal erosion and flooding problems.

Many causes of past and present coastal erosion have a long history and a geographically complex background. It is evident that most of these causes *cannot* be removed within the scope of a typical coastal protection project.

The important elements when dealing with coastal erosion and beach restoration problems are:

1. To investigate the causes of the problem
2. To define the goals for the shoreline management project and to resolve conflicting interests. This phase can also be described as *definition and acceptance of the shoreline management strategy for the project area*
3. To define the financing of the project
4. To engage a qualified group of consultants to assist in achieving the goals of the agreed shoreline management strategy

Coastal engineers' expertise lies especially within items one and four, but items two and three are just as relevant.

This means that:

- coastal engineers must improve their communication and management skills, and
- all other involved parties must improve their basic understanding of the coastal area and of the engineering possibilities

These Guidelines are intended to facilitate this process for the benefit of our valuable shores.

1.2 Some thoughts on Shoreline Management

There is always a delicate balance between the requirements of primary protection against coastal erosion on one hand and protection of the dynamic coastal landscape and sandy shores on the other hand.

Historically, protective measures have been reactive in nature and have concentrated on preventing loss due to coastal erosion. This type of protection has, throughout the world, resulted in loss of the beach and it has had a serious impact on the dynamic coastal landscape. Such protection measures are “coast protection”, not “shore protection”.

1.3 How to read these guidelines

These Guidelines are separated into three parts but the chapters are numbered continuously through the various parts:

- PART 1: Metocean Conditions, Coastal Processes and Coastal Classification, Chapters 2 through 9
- PART 2: Guidelines, Chapters 10 through 19
- PART 3: Hydraulic Study Methodology as Support for Shoreline Management, Chapters 20 through 22
- References and Index are presented in Chapters 23 and 24.

The purpose of Part 1 is to give the reader a basic understanding of the metocean forces acting on the coast and the coastal processes resulting from these forces and how these processes results in coastal changes. Part 1 is opened with a definition of coastal terms to ensure common understanding and meaningful communication and Part 1 is terminated by coastal classification, which is a very useful concept to summarise the status of a coastal section. Part 1 is mainly intended for the interested, non-specialist reader who wants a better understanding of what is happening and why and for the engineer who is venturing into an unfamiliar area and wants an introduction to the subject. The focus is therefore not on the theoretical and numerical side of issues, but on provision of a general understanding of the coastal processes. Practically only very few equations are included in order not to exclude non-scientists from understanding the text. Part 1 should be read from start to finish at least once and can then later be used to look up specific topics or words.

The experienced coastal engineer can skip Part 1 and go directly to Part 2, which contains sections on the following subjects:

- Causes of coastal erosion and coastal flooding including impact of climate changes
- Vulnerability and risk classification for erosion
- Vulnerability and risk classification for coastal flooding
- Planning concepts in the coastal zone
- Coastal projects
- Design philosophy including adaptation to climate changes
- Shore protection, coast protection and sea defence methods with special emphasis on coastal adaptation to climate changes

- Water front development schemes
- Environmental Impact assessment and Morphological Impact Assessment

Part 2 will assist the reader, whether an engineer or a planner, in formulating a suitable strategy for the problem at hand and in selecting realistic solutions. This part can be read from start to finish or used as a reference book.

Part 3 provides guidance in study methodology as support for shoreline management projects divided in data collection and field investigations, numerical modelling and physical modelling

Chapter 23 presents a list of references common for all chapters. In order to make the Guidelines easier to read there are only few references in the text. Chapter 24 presents a subject index.

Results from numerical modelling have been used throughout this book to illustrate coastal processes. The DHI software “MIKE Powered by DHI” has been applied to make these illustrations.