Chapter 1
INTRODUCTION

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Chapter I-1
Introduction

I-1-1. Purpose and Scope

The *Coastal Engineering Manual* (CEM) assembles in a single source the current state-of-the-art in coastal engineering to provide appropriate guidance for application of techniques and methods to the solution of most coastal engineering problems. The CEM provides a standard for the formulation, design, and expected performance of a broad variety of coastal projects. These projects are undertaken to provide or improve navigation at commercial harbors, harbor works for commercial fish handling and service facilities, and recreational boating facilities. As an adjunct to navigation improvements, shore protection projects are often required to mitigate the impacts of navigation projects. Beach erosion control and hurricane or coastal storm protection projects provide wave damage reduction and flood protection to valuable coastal commercial, urban, and tourist communities. Environmental restoration projects provide a rational layout and proven approach to restoring the coastal and tidal environs where such action may be justified, or required as mitigation to a coastal project′s impacts, or as mitigation for the impact of some previous coastal activity, incident, or neglect. As the much expanded replacement document for the *Shore Protection Manual* (1984) and several other U.S. Army Corps of Engineers (USACE) manuals, the CEM provides a much broader field of guidance and is designed for frequent updates.

I-1-2. Applicability

This manual is applicable to U. S. Army Corps of Engineers (USACE) Commands having civil works responsibility. It is anticipated that the comprehensive scope and instructions of this manual will warrant its use by a broad spectra of coastal engineers and scientists beyond the bounds of the USACE. Although this broad application has been considered throughout the development of the CEM, some sections are specific to the mission, authority, and operation of the USACE.

I-1-3. Definitions

Definitions are listed throughout the manual when terms are first introduced. In addition, a glossary of terms is provided in the appendix, and Table IV-1-1 lists definitions of common coastal geologic features. However, a few basic definitions will help the novice to better understand and grasp the purpose and scope of the CEM. Part IV, Chapter 2 defines types of coastal structures.

a. Coastal. Referring to the zone where the land meets the sea, a region of indefinite width that extends inland from the sea to the first major change in topography. In this manual, “coastal” will refer to shores that are influenced by wave processes (oscillatory flow dynamics). Bays, and lakes, and estuaries are included, but rivers, primarily influenced by generally unidirectional currents, are generally beyond the scope of this manual. Estuaries, including that part of rivers subject to the ebb and flow of the tide are covered by this manual.

b. Coastal engineering. One of several specialized engineering disciplines that fall under the umbrella of civil engineering. It is a composite of many physical science and engineering disciplines having application in the coastal area. It requires the rational interweaving of knowledge from a number of technical disciplines to develop solutions for problems associated with natural and human induced changes in the

coastal zone, the structural and non-structural mitigation of these changes, and the positive and negative impacts of possible solutions to problem areas on the coast. Coastal Engineers may utilize contributions from the fields of geology, meteorology, environmental sciences, hydrology, physics, mathematics, statistics, oceanography, marine science, hydraulics, structural dynamics, naval architecture, and others in developing an understanding of the problem and a possible solution. The Coastal Engineer must consider the processes present in the area of interest such as:

- Environmental processes (chemical, ecological).
- Hydrodynamics processes (winds, waves, water level fluctuations, and currents).
- Seasonal meteorological trends (hurricane season, winter storms).
- Sediment processes (sources, transport paths, sinks, and characteristics).
- Geological processes (soil and strata characteristics, stable and migrating sub-aerial and sub-aqueous features, rebounding or subsiding surfaces).
- Long-term environmental trends (sea level rise, climate change).
- Social and political conditions (land use, development trends, regulatory laws, social trends, public safety, economics).

Harbor works, navigation channel improvements, shore protection, flood damage reduction, and environmental preservation and restoration are the primary areas of endeavor.

c. Coastal science. This field is a suite of interdisciplinary technologies applied to understanding processes, environments, and characteristics of the coastal zone. Coastal Engineers use these understandings to develop physical adaptations to solve problems and enhance the human interface with the coast.

I-1-4. Bibliography

Technical and scientific literature cited in each chapter is listed in the chapter references.

I-1-5. References

The following are official USACE engineer regulations (ER), engineer manuals (EM), engineer pamphlets (EP), and technical manuals (TM) found in the bibliographies following each chapter. They are highlighted here for easy USACE use.

TM 5-850-1
Engineering and Design of Military Ports

ER 1105-2-100
Planning Guidance Notebook

EP 1165-2-1
Digest of Water Resources Policies and Authorities

EM 1110-1-1802
Geophysical Exploration for Engineering and Environmental Investigations

EM 1110-1-1804
Geotechnical Investigations

EM 1110-2-1204
Environmental Engineering for Coastal Shore Protection

EM 1110-2-1415
Hydrologic Frequency Analysis

EM 1110-2-1613
Hydraulic Design of Deep-Draft Navigation Projects

EM 1110-2-1615
Hydraulic Design of Small Boat Harbors

EM 1110-2-1906
Laboratory Soils Testing

EM 1110-2-2301
Test Quarries and Test Fills

EM 1110-2-2302
Construction with Large Stone

EM 1110-2-5025
Dredging & Dredged Material Disposal

EM 1110-2-5026
Beneficial Uses of Dredged Material

EM 1110-8-1 (FR)
Winter Navigation on Inland Waterways

I-1-6. Acknowledgments

Authors of Chapter I-1:

Joan Pope, U.S. Army Engineer Research and Development Center, Vicksburg, Mississippi.
John H. Lockhart, Jr., Headquarters, U.S. Army Corps of Engineers, Washington, DC, (retired).

Reviewer:

Andrew Morang, Ph.D., CHL