



## EXECUTIVE SUMMARY

Strategic management and planning within estuaries seeks to identify a framework that enshrines sustainability. Any management initiative must address the issues of

- Long-term change;
- Physical, chemical and biological interactions; and
- System response (including socio-economic interactions).



Achieving such an approach will need to take advantage of studies and research at a number of different spatial and temporal scales. These include:

- 1) Global climate change initiatives;
- 2) Catchment and estuary wide studies;
- 3) Work on specific features (banks, mudflats, etc).

They necessarily consider changes over timescales of seconds to thousands of years. Realistically, for strategic planning and management, the goal is to be able to predict, with a reasonable degree of confidence over a 20 to 50 year time horizon.

It is not yet possible and, indeed, may never be possible to make absolute predictions. Rather, it is necessary to identify probable/possible outcomes, as a basis for guiding management actions. This, in itself, requires managers and planners to move away from prescriptive interventionist approaches, towards more adaptive ones.

This guide seeks to provide an overview of how to identify morphological change within estuaries, as a basis for sound management. The layout is as follows:

- Within this guide, the reader will find an introductory chapter, which looks at the issues of the guide, and the purpose and layout of the guide.
- Secondly, there is a chapter on estuary management; the need for strategic management within estuaries, sustainable development, legislation and the management framework. Thirdly, there is a chapter on estuary setting. This encompasses the classification of estuaries from fjords to spit enclosed; estuarine processes; estuary characterisation and the form and function of an estuary.
- The next chapter looks at the study approach – how a study is undertaken in terms of scope and framework. Within this section, there is a discussion about issues of scale, a summary of the study process; a review of the importance of conceptual models; and an overview of the synthesis and understanding of the study approach.
- Once a study has been outlined, the reader is guided to the study methods; this outlines the ways in which estuarine studies can be undertaken. Within the study methods, there is a review of analysis and modelling, the techniques that are available; model application and errors and uncertainty. A significant amount of emphasis is placed on errors and uncertainty in data collation, modelling setups and statistical analysis.

- The presentation of findings chapter occurs subsequent to the study methods chapter. Here, there is a review of how to present a synthesis report, summaries of individual studies, space-time summaries and an example of a sediment budget.
- The last guidance section is the chapter about assessing impacts. Within this chapter, there is a section on the background to assessing environmental impacts, the EIA framework, and a summary of the assessment framework.
- Lastly, the reader will also find supporting documents, a glossary and a reference list.

The topic is a huge one and the guide only is intended to provide an introduction to some of the key issues. Extensive references have been included as well as a glossary of terms, for those who are less familiar with the subject. In addition, there is a number of supporting documents that provide further guidance, more detailed information on specific issues, or explore some of the theoretical background to certain topics.

Methods and models are evolving rapidly at the moment. In particular there is a lot of effort going in to research of complex systems, non-linear interactions and the prediction of change over relatively long time scales (10-100 years). This means that the guide presents a summary of current thinking. It is hoped that as techniques evolve the guide will be updated to reflect new developments.

## Contents

1.	<b>Introduction</b>	
1.1	The Issues	1.1
1.2	Purpose and Layout of Guide	1.2
2.	<b>Estuary Management</b>	
2.1	The Need for Strategic Management	2.1
2.2	Sustainable Development	2.2
2.3	Legislation and Regulation	2.3
2.4	Management Framework	2.6
3.	<b>Estuary Setting</b>	
3.1	Introduction	3.1
3.2	Estuary Classification	3.2
3.3	Estuary Processes	3.6
3.4	Estuary Characterisation	3.7
3.5	Form and Function	3.10
4.	<b>Study Approach</b>	
4.1	Issues of Scale	4.1
4.2	Summary of Study Process	4.3
4.3	Conceptual Model	4.8
4.4	Synthesis ⇒ Understanding	4.11
5.	<b>Study Methods</b>	
5.1	Analysis and Modelling	5.1
5.2	Techniques Available	5.2
5.3	Model Application	5.5
5.4	Errors & Uncertainty	5.7

6.	<b>Presentation of Findings</b>	
6.1	Synthesis Report	6.1
6.2	Summaries of Individual Studies	6.2
6.3	Space-time Summaries	6.3
6.4	Sediment Pathways and Sediment Budget	6.4
6.5	Conclusions	6.8
7.	<b>Assessing Impacts</b>	
7.1	Background to Environmental Impact Assessment	7.1
7.2	Assessment Framework	7.2
7.3	Summary of the Assessment Framework	7.5

### Acknowledgements

The contents of this website draws on work undertaken for a wide range of funders and interaction with many in the estuary research, consultancy and management community over the period 1998-2007. In particular development funding for research from the Department of Food, Environment and Rural Affairs (Defra), the Environment Agency (EA) and Natural England (NE) has underpinned much of the work. The development of an earlier version of this website was made possible by Associated British Ports (ABP) based on the report: Townend, I.H. (2004). Understanding and Managing Morphological Change in Estuaries. ABP Marine Environmental Research Ltd, Version 1. The present version has been made possible through funding from the joint Defra / Environment Agency Flood and Coastal Erosion R&D Programme, Modelling and Risk Theme (project code FD2119).

ABPmer and HR Wallingford are grateful to our many partners in various aspects of this work, including: Black & Veatch, British Geological Survey, CEFAS, Centre for Ecology and Hydrology, Halcrow, Plymouth Marine Laboratory, Posford Duvivier, Proudman Oceanographic Laboratory, Royal Holloway University of London, University College London, University of Cardiff, University of Durham, University of Liverpool, University of Newcastle, University of Nottingham, University of Plymouth, University of Southampton and WL|Delft Hydraulics Laboratory.