# *Executive Summary*

Whole Life Costs and Project Procurement in Port, Coastal and Fluvial Engineering: “How to escape the cost boxes”

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Whole life costing is not a new concept. However, thinking about costs has traditionally been segregated into “boxes” of capital, maintenance, operational and disruption costs, a split often emphasised by divisions of responsibility within organisations. This manual provides the necessary guidance and data to break down the barriers between cost boxes so that costs can be considered holistically. This leads to more informed project decisions and can reduce costs over the life of an asset. It is also consistent with the present drive towards procuring solutions that are cost effective and sustainable.

Whole life costing involves estimating the total cost of a product, system or structure throughout its entire life. It is about identifying future costs and referring them back to present day costs using standard accounting techniques such as Present Value. The objective of whole life costing is to minimise total lifetime expenditure by facilitating the choice of the most cost effective project option.

Traditionally, project and design decisions in port, coastal and fluvial engineering have been based predominantly on initial capital costs and whole life costs have not been given full consideration. In recent years it has been seen that decisions made on this basis are not always best. For example, when unplanned maintenance work has arisen during the life of a project, especially in ports, disruption costs can be an order of magnitude greater than the costs of the maintenance work itself. Large scale and costly emergency works have also been required in recent years as a result of failing to undertake planned monitoring and maintenance. It is now understood that cost savings and better value can be delivered by basing project decisions on the costs incurred throughout the life of a project. For this reason, various forms of whole life cost analysis are now being used in the port, coastal and fluvial engineering sector.

This guide provides detailed information, including a database containing historic maintenance cost information, to facilitate the use of whole life costing. Case studies are presented showing the application of whole life costing at various stages in numerous port, coastal and fluvial engineering projects.

The guide is divided into three main sections. Part A provides an overview of whole life costing and its application to port, coastal and fluvial engineering. This is supported by Appendices giving information on particular techniques and on maintenance cost data. Finally, a number of case studies are described in Part B and the lessons learned from applying whole life cost analysis in each case study are identified.

# *Executive Summary* continued

**What is whole life costing about?**

Whole life costing techniques, such as Present Value, are applied to the cash flows for various project options using an appropriate discount rate to adjust future costs to facilitate the choice of the best project option. The discount rate currently recommended by the UK government is 6%, commercial rates may be different.

The following costs are included in a whole life cost analysis:

- Capital
- Maintenance and Monitoring
- Risk
- Disruption
- Disposal

Understanding the accuracy of the estimation of future costs and the sensitivity of the final result to these estimations is essential in order to make informed comparisons.

**What inhibits its application?**

There are numerous reasons why whole life costing has not been widely used in port, coastal and fluvial engineering. Some of these include:

- Whole life costs are not viewed holistically. The traditional view of capital and maintenance budgets is that they belong in "separate boxes".
- The inflexibility of current funding arrangements discourages the true implementation of whole life costing (e.g. the lack of MAFF grant aid for the maintenance of hard defences).
- There may be pressure to show a financial return on an asset within a short time scale, typically 5 - 10 years, without taking full account of durability issues and monitoring, maintenance and disruption costs. This short-term approach and lack of consideration of durability issues may negate any early returns by increasing costs over the life of the asset. This is contrary to the current drive towards economic and environmental sustainability.
- It is generally not required or understood by the owner and emphasis is often placed on lowest capital cost and not on the overall life of the facility.
- There are concerns over the uncertainties associated with forecasting the timing and magnitude of future costs.

Work is currently under way to address these concerns through industry forums, workshops and research projects such as this.

**Why use it?**

There are many benefits from adopting a whole life cost approach to investment decisions. Total lifetime expenditure is minimised, discussion between all parties involved in the project process is encouraged early on in the project programme and there is early quantitative consideration of the financial effect of the following:

- risks
- potential problems
- monitoring and maintenance requirements
- functional performance
- material specification
- long term durability
- downtime and loss of business

Whole life costing can be used throughout the lifetime of an asset:

- to compare outline designs
- to refine the detailed design by assisting in the choice of design elements
- to assist with management decisions such as whether to rehabilitate, replace or dispose of a structure or elements of that structure.

**What have we done to support the use of whole life costing?**

1) Provide concise guidance (see Part A)

Part A of the manual contains concise guidance on various aspects of whole life cost analysis. This is supported with detailed background information in the Appendices.

2) HR Wallingford Database of maintenance and monitoring costs (see Appendix 3)

To develop a consistent approach for estimating the maintenance costs of port, coastal and fluvial structures, HR Wallingford have compiled an internet accessible database at www.wholelifecosts.org containing maintenance cost information for the following engineering elements:

- Groynes
- Breakwaters
- Sea walls
- Jetties
- Wharves/quays
- Beaches
- Revetments

The database can be used to provide an indication of the likely maintenance and monitoring costs associated with each of the generic elements outlined above. Environmental and other factors can be used to limit the search so the costs are more closely aligned with those of the structure and site constraints under consideration. Individual records can be viewed, which contain additional notes and explanations on the most common maintenance issues arising with each element.

3) Provide examples of the use of whole life costing (see Part B)

Part B of the guidance manual contains detailed case examples showing the application of whole life costing at various stages of the project process in the port, coastal and fluvial engineering sector.

# Foreword

The authors of this guide are employed by HR Wallingford (HR). The work reported herein was carried out under a Contract jointly funded by HR Wallingford and the Secretary of State for the Environment, Transport and the Regions placed on 29 June 1999. Any views expressed are not necessarily those of the Secretary of State for the Environment, Transport and the Regions.

This guide constitutes HR Wallingford report SR 567. The objective of the project was to draw together existing knowledge, experience and research, including that gained from case studies, to produce detailed guidance on the current and potential uses of whole life costing in port, coastal and fluvial engineering.
The project was managed by Neal Masters and Jonathan Simm of HR Wallingford. This guide was also written and edited by Neal Masters and Jonathan Simm. The HR Wallingford job number was CDS 0415

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| • Environment Agency | Government Department |
| • Arun District Council | Local Authority |
| • Railtrack | Private Company |
| • Currie & Brown | Quantity Surveyors |
| • Brown & Root | Consultants |
| • Dean & Dyball | Contractors |
| • Mackley Construction | Contractors |
| • Posford Duvivier | Consultants |
| • Poole Harbour | Port Authority |
| • Felixestowe Port | Port Authority |
| • Associated British Ports Southampton | Port Authority |
| • Reading University | Research Organisation |


***Steering Group:***

The research was guided by an advisory committee which was comprised of the following members:

| | |
|---|---|
| Jonathan Simm | HR Wallingford (Chairman) |
| Neal Masters | HR Wallingford |
| Marco Santini | HR Wallingford |
| John Mason | Alan Baxter & Associates (DETR project officer) |
| Dr Geoff Sims | Brown & Root |
| Alan Hardie | Railtrack |

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| David Weight | Currie & Brown |
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***Jonathan Simm*** *is a chartered civil engineer who worked with consulting engineers for 14 years on the design and construction of port and coastal defences before joining HR Wallingford in 1992 as manager of the Engineering Support Section. He is now Technical Director for engineering and continues to be responsible for consulting and research studies aimed at bridging the gap between theory and practice.*

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