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results

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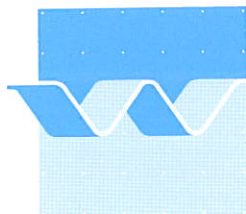
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CZM Tools and Guidelines - Workshop results

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TITLE: CZM Tools and guidelines - Workshop results

ABSTRACT:

During the workshop in Caen it became clear that the returned questionnaires that had been sent out to the project partners did not contain all information necessary to translate the COAST3D project results to potential endusers. The questionnaires resulted in descriptions of tools and guidelines on HOW to use them. What was lacking was information on WHEN to use them. The included documents describe parts of the process that was followed to obtain this type of information. In particular the results of the COAST3D workshops that were held in Caen from 5 to 7 June 2000 and Schiphol on June the 27th 2000 are described. The results of the Caen workshop have been processed in the 'Introductory documents CZM workshop, Schiphol'. The results of the Schiphol workshop have been processed in the 'Minutes of COAST3D CZM Tools meeting'. The described process resulted in the development of a 'peeling off' approach. This approach will be followed by the project partners in the coming months.

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VER.	ORIGINATOR	DATE	REMARKS	REVIEW	APPROVED BY
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Introductory documents

CZM workshop, Schiphol

June 2000



EC MAST Project No. MAS3-CT97-0086

**'Introductory documents CZM
workshop, Schiphol'**

COAST3D CZM tools: discussion of hypothetical cases

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1. Introduction

In this document you find background information for the CZM workshop at Schiphol on 27-6-2000. Section 2, 3 and 4 describe the problem, the objectives and put forward a suggested general approach for the studies necessary to solve hypothetical CZM problems. The approach has been formulated as a result of discussions between the Environment Agency (representing a typical end-user) and HR Wallingford (representing a typical commercial laboratory) concerning the Teignmouth case; and likewise of discussions between RWS and Delft Hydraulics concerning the Egmond case. Hypothetical case studies for Egmond and Teignmouth are described in sections 5 and 6. In section 8 we have formulated a series of specific questions to modellers and to experimenters.

The approach and the questions as described are intended to stimulate discussion at the CZM Workshop in Schiphol on 27 June 2000 – it is not intended to be the definitive document.

Please read carefully through the various questions which are posed for each part of the study, and think about the answers you could provide to those questions which are relevant to your experience/expertise.

During the workshop we particularly want to hear about lessons learnt/experience gained during the COAST3D project. Some of the partners have already answered some of the questions in response to the CZM Questionnaire. If this applies to some of your answers, please remind us during the workshop

In case additional analysis effort is required to come up with specific answers to the questions, we would welcome any suggestions. The feasibility of additional efforts either under the heading of practical modelling or the heading of data analysis by experimenters, is a discussion item at the workshop.

2. The general problem

A regional engineer wishes to commission certain studies, possibly including field measurements, data analysis and modelling for the study area under his control. He/she has only limited budget available for these studies and will therefore be seeking best value for money from the studies. Also there is limited time available for these studies. He/she wants to know what studies are recommended given a specific problem.

3. The general objective

The overall objective of the CZM toolgroup is to provide guidelines that help the CZ manager to judge and design the best mix of modelling and field work to describe the coastal behaviour at the required accuracy level. We are *not* looking for a 'recipe book' on how to use models or how to carry out field measurements. To provide these guidelines we wish to present an overview of the available technology and the technology developed in the COAST3D project regarding modelling, monitoring and data analysis.

4. The general approach

We suggest that the general approach to the earlier mentioned studies can be grouped under 5 main headings:

- Step 1. Collation of background information
- Step 2. Monitoring
- Step 3. Measurement
- Step 4. Modelling
- Step 5. Interpretation

These five headings can be used to describe many studies to solve CZM problems.

Step 1. Collation of background information

Background information for the COAST3D experiments was obtained from

1. Literature search (papers, reports, tide tables etc.)
2. Historical charts, maps, photos and pictures
3. Discussions with local officials (Harbour Commission, District Council)
4. Discussions with local population (Fishermen)
5. Discussions with regional officials (MAFF, Environment Agency, County Council, RWS)
6. Discussions with regional universities (Plymouth, TUDelft)

Similar sources of background information will exist for most CZM sites.

Step 2. Monitoring

By monitoring, we mean the routine measurement of basic parameters over medium to long timescales (say 12 months or more). At some sites, some monitoring may already be in progress – e.g. for tidal heights.

Parameters that might be monitored could include:

1. Tidal heights, currents
2. Wave heights, periods, directions
3. Beach levels, nearshore/offshore bathymetry
4. Sediment sizes
5. Wind speeds and directions
6. Suspended sediment concentrations/transport
7. Bed forms/transport
8. Water temperature, salinity, quality

Typically it is difficult to persuade end-users to commission monitoring programmes – either the costs are too high, or more often a decision/solution is required before useful results become available from the monitoring. One of the objectives of the CZM group is to provide guidelines that help the CZ manager to judge monitoring approaches.

Step 3. Measurements

By measurements we mean short-term investigations of local and/or specialised parameters, typically over one tidal cycle, or perhaps a spring-neap cycle, or possibly before and after a storm. Very often the need for such measurements will be dictated by the modelling approach which is proposed. Sometimes measurements will be required to gain insight into ongoing processes. Again, end-users require some justification for the measurement programme.

Step 4. Modelling

In some cases the use of models may be required to support the decision process. To enable answers to the problem to be found, any modelling must be able to reproduce the behaviour of the dominant morphological features (eg. For Teignmouth existing channel/sandbank system, of the existing beach, and of the existing sea outfall). Even within models, there are several possible approaches. Whatever approach is recommended, this must be justified to the CZ manager:

Typical considerations are:

- Why should I use a model (if any)?
- What type of model to use?

- 2DV, 2DH or 3D?
- With/without stratified flows?
- Finite Difference (with rectangular or curvilinear grid) or Finite Element (triangular grid)?
- What area to be covered, and why? (e.g. model must extend beyond possible area of influence of proposed works)
- How to match grid element size to important features? (e.g. grid size in approach channel?)
 - What physical processes should be included, and why? (e.g. wave current interaction, wetting/drying elements, sediment transport)
 - What physical processes are omitted? (can be ignored, or impossible to model at present?) (e.g. swash zone sediment processes)
 - What data/information is needed to set up model? (e.g. bathymetric data, boundary conditions)
 - What data/information is needed to calibrate/validate model? (e.g. tidal currents at strategic locations)
 - Which of these data/information requirements are “essential” or “desirable”, and why?
 - What “added value” is provided by the “desirable” data? (e.g. bedform data from side-scan sonar)
 - What test conditions will be applied, and why? (e.g. waves/tides/scenarios).
- Operational issues
 - How user-friendly is the model? (research model or commercially released software?)
 - How costly is the model? (e.g. computing time per test?)
 - How cost-effective is the test programme?

Step 5. Interpretation

All the information/data/results from the above parts of the study need to be integrated and interpreted for the benefit of the CZ manager.

Typical considerations are:

- How to analyse/interpret measurement/monitoring data?
- How to extrapolate data (e.g. for extreme waves/tide levels)?
- How to predict:
 - Annual and/or maximum infill rates from few test runs? (Perhaps through use of monitoring data?)
 - maximum/minimum beach levels ?
 - dispersion from sea outfall?
- How to present the results to the port authority and/or planning authority?
 - Deterministic or probabilistic?
 - Sensitivity analysis and confidence limits?

5. Specific case Teignmouth

Teignmouth has an active port that must maintain safe navigation over the shifting outer sandbanks.

The present system of maintaining depths along the approach route is by dredging almost every day of the year. Sand is dragged from the high points of the channel, where it crosses the outer sand bank system, and is deposited away from the channel. This system was adopted about 3 years ago, and the harbour master thinks that it is more effective than the old bucket dredger that it replaced. Nevertheless, ships have gone aground twice during the time of the COAST3D observations.

As a hypothetical case study, we will imagine that the port authority needs to investigate the commercial viability of providing for vessels with a greater draft. This means that the depth along the approach channel must be greater, and also that the depth at the quayside will have to be increased. *This is not such a wild idea. In about 1970 such a proposal received considerable attention. To stabilise the approach channel, the construction of a training wall was suggested. This would have been 500 metres long, in a direction due east from the southern tip of the Denn. The proposal was eventually rejected because of cost.*

In order to satisfy its shareholders, the port authority will have to determine the most cost-effective way of providing and maintaining a deeper approach channel. In order to satisfy the planning authorities, the port authority will have to demonstrate that the deeper approach channel and its associated maintenance system will not adversely affect other interests. At Teignmouth, the planning authorities would probably insist that consideration should be given to the effects of the proposals on (1) the adjacent beach, (2) flooding, and (3) the safe disposal of sewage to sea

- (1) The beach is an important resource for the town's holiday resort businesses, and must be maintained sandy, unpolluted and attractive.
- (2) Flooding of low-lying parts of the town has occurred in the past, and remedial action has been taken. Flooding must not be allowed to recur.
- (3) Sewage from Teignmouth and Shaldon is disposed of through a long sea outfall. The effectiveness of that outfall must not be reduced.

Therefore, in order to answer questions from its shareholders and from the planning authorities, the port authority would wish to commission certain studies, possibly including field measurements, data analysis, and modelling. However, since the proposal is rather speculative, it is likely that the port authority would have only a limited budget available for these studies. The port authority would therefore be seeking best value for money from the studies. Also, it is likely that there would be only a limited time available for the studies: typically this could be as little as 6-9 months, but possibly the port authority could be persuaded to extend this to about 18 months.

If the port authority approached the COAST3D project team for detailed proposals for appropriate studies, how would the team respond? What studies would the team recommend, and how could those studies be justified to the port authority?

6. Specific case Egmond

Egmond is a holiday resort to a large extent depending on beach recreation. Maintenance of a wide and safe beach and protection of the boulevard in the central part of the village, is of prime importance to the local authorities. Prevention of coastal retreat and safeguarding against flooding is the responsibility of Rijkswaterstaat at a national level.

Since the 80's Rijkswaterstaat has tried to serve the combined national and local interests by repeatedly applying of beach nourishments.

As a COAST3D-CZM **case study** we consider the situation where Rijkswaterstaat wishes to investigate the effectiveness of a potential alternative:

- implementation of a shoreface nourishment of order 2-3 Mm³, in order to extend the life time of a traditional beach nourishment.

Local authorities will insist that design of the shoreface nourishment by Rijkswaterstaat will take account of the effects on:

- resulting beach widths (especially during the summer season)
- safety for swimming (i.e position and dimensions of rips).

Therefore the Regional Directorate of Rijkswaterstaat wishes to commission certain studies, possibly including field measurements, data analysis and modelling. The Regional Direction has only limited budget available for these studies and will therefore be seeking best value for money from the studies. Also there is limited time available for these studies. What studies are recommended and how could these studies be justified?

7. Specific approach for Schiphol workshop June 27th 2000

Based on the above-described general approach and case descriptions we reduce the web of choices and considerations to a concrete approach for the CZM workshop on June 27th.

For both cases we suggest application of models:

- for Teignmouth *area models*
- for Egmond *profile models* to start with, and potential use of *area models*

Then we are interested in the relative value -indicated both in terms of possible **accuracy** of the results and in terms of associated **cost / effort-** of different approaches:

- a *minimum approach* which model and why ?
 - what minimum data demand to drive the models ?if (despite our suggestion) no model will be used:
 - what minimum information / data are required ?
- a *maximum approach* using all COAST3D tools and info (model concepts and measurements)
 - what is the added value ?

The COAST3D situation differs significantly from a standard CZM situation in the abundance of available data. Therefore we may assume that cases at Egmond or Teignmouth using all available COAST3D information represent a maximum possible approach to the calibration of models with measurements
- an *optimum approach* Model results can be very much improved if local information of currents, wave heights and deposited materials (volumes and composition of deposited material) is available to calibrate/validate the models. The basic questions are:
 - where, when and how much additional data is needed?
 - which combination of model and measurements is able to present an output within a reasonable range of accuracy of the maximum approach (say 25%) at what cost ?

8. Specific questions

- **Based on this specific approach a range of questions have been formulated to modellers and experimenters, which we aim to discuss during the coming Schiphol workshop.**
- **Please prepare yourselves to answer these questions both for the Teignmouth-case and for the Egmond-case**
- **Please keep in mind the overall objective, which is to produce CZM guidelines for an optimal mix of modelling and experimenting.**

8.1 Questions to MODELLERS:

Suggested work method:

The minimum and maximum model approach should be common practice by all COAST3D modellers. We therefore ask each participant to analyse both the minimum and maximum approach in the same way and to compare the accuracy of both approaches. To derive this information and prevent the waste of valuable time we *suggest* the use of a selected period (to be determined by the modellers group) of one of the common test runs.

Model capabilities

1. Can your models be applied to compute the wave heights, currents, sediment transport rates and deposition rates in the Teignmouth/Egmond case for the minimum approach? Record the reasoning behind your answers.
2. Specify the physical processes omitted/included in your model and the dominant parameters of your model with respect to waves, flow, sediment transport and deposition.

Minimum/maximum approach

3. Specify the minimum data demand to drive the models (number of parameters, number of locations, accuracy requirements)
4. Specify the accuracy of the computed wave height, current, sediment transport and deposition rate in case of the minimum and maximum approach.
5. Estimate and rank the relative contribution of each physical process (waves, currents, sediment transport etc.) to the difference in accuracy between the minimum and maximum approach.

Optimal approach

6. Say you were allowed to use only three instruments to optimise your minimum approach, which instruments would you choose and where would you choose to put them? Record the reasoning behind your answer in relation to question 5.

Operational aspects

7. How many manweeks do you need to set up, run and interpret the model in the minimum, maximum and optimum approach?

8.2 Questions to EXPERIMENTERS

Measurement capabilities:

Hydrodynamic aspects

Specify the methods (and accuracy involved) that you have to determine

1. the wave data in the area,
2. the currents in the area (how many points above the bed),

Sedimenttransport aspects

Specify the methods (and accuracy involved) that you have to determine

3. the sediment transport rates in the area (how many points above the bed),
4. the influence of swash-zone processes

Morphological aspects

Specify the methods (and accuracy involved) that you have to determine

5. the spatial distribution of bed forms in the study area,
6. the spatial distribution of bed material,
7. the bed level changes in the area.

Minimum/maximum/optimum approach

8. In case no model is available, what do you consider to be the minimum data requirements (dominant parameters, how to measure, locations and frequency) to provide a solution to the case problem?
9. How can your *current* COAST3D results combined with your process knowledge, contribute to the cases at hand?
10. What do you consider the optimum monitoring- and measurement lay out to contribute to the cases at hand? (instrumentation, spatial and temporal distribution)

Operational aspects

11. Specify the number of manweeks that you need to provide the necessary system knowledge.
12. Specify the number of manweeks that you need to deliver the results in terms of standard parameters ($H_{1/3}$, H_{rms} , T_p , u_{mean} , v_{mean} , etc.).

**'Minutes of COAST3D CZM Tools
meeting'**

**Minutes of COAST3D CZM Tools meeting
27-6-2000
Ibis Amsterdam Airport hotel**

Participants:

RWS - J. Mulder [JM] (Chairman)	EA - M. Owen [MO] (Co -chairman)
RWS - M. van Koningsveld [MvK] (Reporter)	EA - J. Rawson [JR]
HR - R. Soulsby [RS]	UL - J. Nicholson [JN]
DH - L. van Rijn [LvR]	CIIRC - C. Mosso [CM]
UU - P. Hoekstra [PH]	POL - P. Bell [PB]
UU - G. Ruessink [GR]	

Detained by other obligations:

UPL - D.Huntley	UCA - F.Levoy
MAGELAS - J.Lanckneus	

Agenda

10:00	Opening and discussion approach
10:30	Egmond
-	discussion on questions and considerations
-	actions
13:00	Lunch
14:00	Teignmouth
-	discussion on questions and considerations
-	actions
16:30	Conclusions
-	planning of actions
17:00	Closure

Opening and discussion approach

[JM] opens with a short presentation of the objectives of the meeting and its function in the production of the CZM tools and guidelines end report. The objective of the CZM tools group is to derive guidelines on an optimal mix of modelling and fieldwork as CZM problem solving tools. The dilemma is how to derive guidelines that are generic from the COAST3D research results. The CZM tools group suggests the following approach:

- Step 1: discussion of specific cases (Egmond – Teignmouth)
- Step 2: derivation of generic guidelines from the results by the CZM tools group

To facilitate a useful interpretation in step two, the cases of Egmond and Teignmouth need to be worked out in detail. The choices in working out the cases need to be made with the objectives of a minimum/maximum and optimal mix between modelling and fieldwork in mind. The results of the questionnaire and the CZM workshop at Schiphol, together should then enable a useful interpretation of the COAST3D results into a CZM Tools and guidelines report.

Discussing the Egmond case

The first part of the discussions on the Egmond case is directed at defining the exact problem more clearly. Several questions are posed on what exactly needs to be calculated: Should there be a focus on the lifetime of the nourishment, the behaviour of the nourishment or the effects of the nourishment on the beach and rip currents etc? During the workshop in Caen a desire for more concrete questions was expressed. At the Schiphol workshop it becomes clear that the development of engineering solutions for the two specific cases is a bridge to far. First, it is not and cannot be the specific objective of COAST3D; and second, either the models are not equipped to present the requested answers or there is a lack of time and budget.

It is decided that the cases should be directed at identifying the minimum, maximum and optimum mix of modelling and fieldwork. The comparison of different scenarios does not provide added value for this particular objective. It seems impossible to determine one single optimum because the optimum is too dependent on the availability of time and money in each particular coastal management problem. The research should therefore be directed at providing the coastal manager with arguments to make this consideration by himself.

Modelling

An agreement is reached on using a 'peeling-off' approach for simplified modelling cases -with perhaps limited practical relevance- to increase feasibility within the scope of COAST3D. [LvR] suggests the calibration of each model against all available Coast3D data should be considered the maximum accuracy each model can attain. Applying this calibrated model to a nourishment example is considered the maximum approach. By 'peeling off' measurements, recalibrating the model and evaluating the loss of accuracy compared to the maximum approach we should get an indication of the added value of the measurements. By following this 'peeling-off' process we can provide the coastal manager with a feel for the sensitivity of models to measurements, and for the type and number (= cost) of instruments to be applied.

The preliminary case description is directed at applying profile models to predict the behaviour of the bar system at Egmond with the nourishment applied in the trough.

- The maximum approach will include data of 7 stations for wave heights and 7 stations for currents.
- The minimum approach will only use data of an offshore measurement station and no internal wave and current data.
- An extra case using 2 stations for wave heights and 2 stations for currents will be used to illustrate the impact of the 'peeling off' approach.

It is suggested to run the profile models for a period of two years.

[JN] dissociates Liverpool from this approach because he does not feel the approach will give useful results. He sees more use in trying to overcome the limitations of the models to develop as good as possible answers to the actual cases. Although this is a very interesting approach from the coastal manager's point of view, choices have to be made as to what is feasible within the constraints of the project. It is decided that because COAST3D has focussed on modelling and fieldwork it makes sense to focus on the arguments to decide on the mix between modelling and fieldwork. The approach seems very promising and presents a good opportunity to reflect the typical achievements of COAST3D.

Not everyone may be able to follow the 'peeling off' approach exactly however. Those who can not are asked to contribute what they can to the overall objective. [LvR] will formulate and distribute the approach of the Egmond case in more detail.

Action : LvR

Experimenting

After a discussion of the view of Utrecht on the possible contribution of the experimenters to the minimum/ maximum approach of the modellers, the desire is expressed for the fieldworkers to use an approach *without* models. This agrees with the practical fact that many CZM problems are solved without the use of models.

[GR] states that in his opinion the minimum approach for the experimenters would be to measure morphological change and boundary conditions and correlate the two. This would illustrate 'what' is happening in the system. Additional measurements can be directed at understanding system processes leading to an understanding of 'why' the boundary conditions cause the observed change in the system.

[PH] states that for Egmond, Utrecht will produce a synthesis of all the system knowledge that has been developed from the field measurements. This synthesis will be presented to the experimenters group as an input for a discussion on a minimum / maximum / optimum approach to the Egmond case

Action: PH

Discussing the Teignmouth case

Modelling

[MO] describes the CZM problems at Teignmouth. Just like in the Egmond case, finding a final 'engineering' solution for the Teignmouth case is not the objective and impossible within the context of the COAST3D project.

A 'peeling off' approach similar to the Egmond case seems to be a useful and feasible option. It is stressed that the complexity of the problem would automatically lead to an integrated modelling approach. In contrast to the Egmond case an area model would be needed to come up with useful answers. The use of an outer model to drive an inner model, is an important consideration in cases like the one at Teignmouth. In a 'peeling off' approach different options to drive the model in a more complex way exist, beside options to add or subtract field measurements.

A discussion on what needs to be modelled starts: how important are eddy's, do we want to address impacts on adjacent beaches etc. Finally it is agreed that a similar 'peeling off' approach like for Egmond will be applied for the Teignmouth case.

The case will focus on siltation rates after a deepening of a fixed part of the channel mouth.

- The minimum approach will use tide levels, admiralty charts, the outer model and no internal measurements.
- An intermediate approach makes use of two continuous monitoring points on water levels, wave heights and currents.
- The maximum approach will use all available COAST3D data. [RS] will formulate and distribute the approach of the Teignmouth case in more detail.

Experimenting

To contribute to the originally suggested problem [PH] suggests the following minimum approach for the Teignmouth case from the experimenter's point of view:

- measurements of change of channel morphology; 4 – 5 measurements in channel
- measure channel transect; vessel + echo soundings every 1 or 2 months
- use the Argus system
- measure beach development several times a year a few 100 meters apart
- measure boundary conditions; waves, tides, currents.
- Use a vessel to measure outfall soundings

A maximum approach would include a cross channel array of bed frames at 5 or 6 positions and measurements over a spring neap cycle.

Some discussion starts on where to put the extra frames. [JM] stresses again that one of the most important results of the Schiphol workshop should not be where to put the frames, but information on why to put the frames at different locations. We are less interested in the 'final' solution and more in the argumentation. [PH] agrees and states he will adjust his suggestion for the changes in the renewed Teignmouth case and mail it to the CZM tools group.

Action: PH

A final remark is that an overall description of the coastal system as is being done for Egmond will probably not be made for Teignmouth.

Conclusions and planning of actions

It seems that everybody is happy with the suggested 'peeling off' approach for modellers as well as experimenters. It is the general feel that the approach will provide useful information to practical CZ management, at the same time representing a typical achievement of COAST3D making optimal profit out of the project's main research activities.

[RS] suggest the following planning of actions:

	CZM group	Modellers	Experimenters
1 oct 2000	Write draft of Egmond and Teignmouth case studies	DH & HR specify modelling tasks	
1 oct 2000	Identify gaps and ask questions		
1 jan 2001	Draft of CZM report	Do the modelling and answer the outstanding questions	Answer outstanding questions
1 feb 2001	Fill in the blanks and draft full CZM report		Write integrated Egm. Reports
1 mar 2001	Final input	Final input	Final input



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