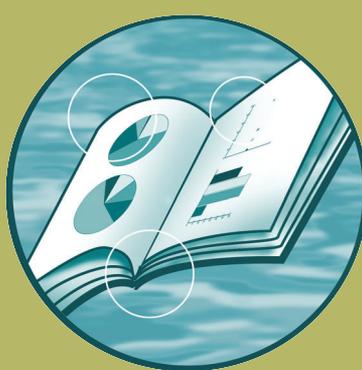
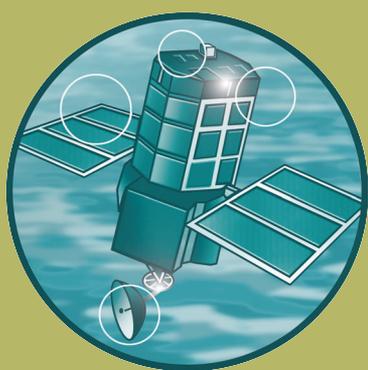


# Developing an evidence base for improving appraisal guidance

R&D Technical Report FD2019/TR





Joint Defra/EA Flood and Coastal Erosion Risk  
Management R&D Programme

## Developing an Evidence Base for Improving Appraisal Guidance

R&D Technical Report FD2019/TR

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# **Executive summary**

## **Background/need**

This study, through consultation and reviewing and analysing existing guidance and appraisals, explores the potential for improvements to the existing flood and coastal erosion risk management project appraisal guidance (including the FCDPAG series, Catchment Flood Management Plan (CFMP) and Shoreline Management Plan (SMP) guidance and the FCDPAG3 spreadsheets).

## **Main aims and objectives**

The aim of the study, as set out in the project specification, is to explore the potential for improvements to the existing project appraisal guidance (Defra 1999-2001) to reflect the findings of the Foresight Study (OST 2004) and the direction of travel identified in the Government's first response to the Making Space for Water (MSfW) consultation (Defra 2005).

The objective of the study is to develop evidence that will allow Defra and the operating authorities to improve guidance and thus assist practitioners to make better decisions.

The study involved identifying the problems associated with the current guidance through consultation with users of the guidance (using questionnaires and workshops), reviewing appraisals that have been undertaken, and assessing guidance and appraisal processes used in other fields.

## **Results**

The evidence shows that some of the tools and techniques needed to undertake appraisals are provided in a number of the guidance documents. This leads to duplication, but there are also some issues that are not adequately covered leaving practitioners without a clear route to follow. There are problems with the (non) identification of the project objectives and definition of the baseline. Social and environmental issues are rarely captured, and non-structural and innovative solutions are only occasionally considered. Further problems are introduced when the benefits are being assessed, with these only rarely looking beyond what can be easily monetised or explicitly included in the priority score. The sensitivity analysis is often undertaken without reference to uncertainty in key assumptions such that the robustness of one option over another is not tested. This has resulted in Project Appraisal Reports that are not transparent, include limited information on how impacts were considered (other than property damages) and although it appears that the 'right' option has been chosen there may be little confidence that it is the 'best' option.

## **Conclusions and recommendations**

Based on the evidence gathered it can be seen that the existing guidance, although fulfilling a need in the past, is limited in its scope especially on decision

making, is not easily updated to keep abreast of changes, and users do not find it particularly user friendly. The solutions proposed include:

- developing separate (but linked) guidance for Defra policy and tools and techniques used in the process. Defra and the Environment Agency have already started this;
- the wider challenge of addressing the diverse range of skills and competencies of appraisers, to ensure that they have the relevant expertise and understanding. This cannot be achieved by changes to the guidance alone. Other solutions will need to include training, mentoring and networking;
- a change of emphasis to the appraisal process is required to provide the 'best' solution that is optimal, sustainable and adaptable (building on the initiatives in MSfW);
- there needs to be a much wider scoping and screening of all impacts at an early stage to target effort to where it is most needed so that the appraisal is efficient and effective. This will help ensure that the decision is based on the most important drivers and the appraisal is based on addressing risk and uncertainty;
- guidance should be tiered to take account of the differing needs of the different levels of appraisal and the different skills of those using the guidance. Defra and the Environment Agency are planning to explore this;
- all guidance should be easily accessible, searchable and updatable. Defra and the Environment Agency are already aiming at this, as shown by the example of this is the recent Multi-Coloured Handbook;
- the decision to invest should be at a strategic level with the implementation through schemes that are appraised against cost-effectiveness, sustainability and optimisation, with identification of which baseline (do-nothing, do-minimum, continue current practice) is most appropriate at the different levels. The implication of this for both Defra and the Environment Agency needs to be investigated further; and
- there needs to be a strong understanding of the link between the appraisal and the approach to prioritisation.

While solutions could be introduced to cover each of these areas separately, this is likely to result in an appraisal process that would take longer and cost more, which is unlikely to be acceptable. As a result, practitioners are likely to find it difficult to implement the changes and the risk is that the potential solutions would not be realised. Thus, it is proposed that the guidance be significantly restructured to address the issues raised. There is also the potential that good guidance, introducing the solutions proposed above, could help address some of the wider issues.

Consultation also highlighted that there are wider issues, suggesting that the guidance is only one of the problems leading to difficulties with the appraisal process. Others identified include: time, resources, skills, limitations on data, uncertainty in data, difficulty of measuring some benefit types, organisational inertia and human nature of wanting to provide/justify the best standard possible for the people living in their project area. These wider issues cannot be achieved by changes to the guidance alone.

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# 1. Introduction

## 1.1 Overview of the study

Through reviewing and analysing how existing guidance is used and how existing appraisals are carried out, this study aims: to provide a better understanding of the guidance that supports the appraisal process, how it can be improved to contribute to better decisions, be cost effective in the quest to reduce risk and be consistent with sustainable development principles.

The study has been informed by other projects being carried out under the MSfW delivery programme and R&D projects such as:

- “Identifying the barriers and incentive to the delivery of better environmental and social outcomes”;
- “Evaluating a multi-criteria analysis methodology for application to flood management and coastal defence appraisal” (FD2013) and the pilot trials of the methodology currently being undertaken by the Environment Agency;
- “Development of economic appraisal methods for flood management and coastal erosion protection” (FD2014);
- “Developing flood and coastal erosion risk management appraisal (testing the “Sugden” approach) (FD2018); and
- “Regionalised impact of climate change on flood flows” (FD2020).

The study involves five tasks, each of which focuses on a different aspect:

- Task A1: review of guidance documents – this includes not just the current suite of flood and coastal erosion risk management (FCERM) guidance but also guidance documents used in other fields. This task provides evidence in terms of what is currently provided as guidance (and which provides much of the context for the discussion in this report) and alternative approaches to presenting and providing information;
- Task A2: structured feedback – this task has involved the use of questionnaires and workshops to obtain the views of those using and applying the guidance as well as Members of the Public. This task provides evidence on where there are current problems and explores potential solutions;
- Task B1: review of Project Appraisal Reports (PARs) – 66 PARs have been reviewed to identify what is (and is not) currently included in appraisals and where there are inconsistencies. This provides evidence on what is currently being done and how, with the best sections/approaches used to help identify how potential solutions could be implemented;
- Task B2: review of appraisal processes used in other fields – this task focuses on approaches used elsewhere and how different/similar they are to the approach used in FCERM. The results of Task B2 are used to provide evidence on how the approach used in FCERM could be modified to reduce some of the problems identified in Tasks A2 and B1; and

- Task C: better reflecting future changes and promoting adaptability – this task looks in detail at the use of scenarios, including the need to consider how a scenario-based approach could encourage integration. This is to provide evidence on the potential use of approaches that incorporate scenario analysis.

The results of each task are brought together in this report to provide the base evidence in terms of the problems that are currently faced, the causes of those problems and to help identify and justify the proposed solutions.

## **1.2 Aims and objectives of the study**

The aim of the study as set out in the project specification is to:

- explore the potential for improvements to the existing project appraisal guidance (Defra 1999-2001) to reflect the findings of the Foresight Study (OST 2004) and the direction of travel identified in the Government's first response to the Making Space for Water (MSfW) consultation (Defra 2005).

The objective of the project is to:

- develop evidence that will allow Defra and the operating authorities to improve guidance and thus assist practitioners make better decisions.

## **1.3 The guidance covered**

The FCERM guidance being considered includes:

- the Flood and Coastal Defence Project Appraisal Guidance (FCDPAG) series, which includes five volumes:
  - FCDPAG1: overview including general guidance;
  - FCDPAG2: strategic planning and appraisal;
  - FCDPAG3: economic appraisal, including the FCDPAG3 spreadsheets;
  - FCDPAG4: approaches to risk; and
  - FCDPAG5: environmental appraisal.
- Shoreline Management Plan guidance (SMP and SMP2);
- Catchment Flood Management Plan (CFMP) guidance Volumes 1 and 2;
- the Multi-Coloured Manual (MCM, new and old versions) and Handbook (MCH); and
- Project Appraisal Report Guidance.

## **1.4 Organisation of this report**

This Final Report sets out the results of the study by answering a series of questions taken from the specification for the project. Each section includes a

summary of what the current guidance says to provide the context for the questions:

- Section 2 provides the overall context for the Final Report;
- Section 3 covers the presentational aspects of the guidance including if, where, how and why it needs to be changed;
- Section 4 focuses on the current level of detail included in the guidance and whether this is sufficient, including how to ensure appraisal tools are supporting efficient and effective assessments;
- Section 5 considers the baseline, the current level of resources required to assess it and whether it is (or is not) the most appropriate baseline;
- Section 6 assesses the approach to identifying options and whether this is providing a good basis for identifying the most sustainable solution;
- Section 7 concentrates on screening, how it is currently used and whether this is allowing appraisals to focus in on the key issues and options;
- Section 8 discusses the assessment of damages and benefits, what is or is not included and how the results are used;
- Section 9 describes the use of sensitivity analysis, how it is used and how it informs selection of the preferred option;
- Section 10 sets out how scenarios and future changes are and could be used in economic appraisal;
- Section 11 discusses decision-making and optimisation, how this is currently done and what needs to happen to ensure that the most sustainable, adaptable and cost-effective options are identified and taken forward for implementation;
- Section 12 considers the impact of residual risks and extreme events on decision-making, how they are currently taken into account and how they are communicated to stakeholders; and
- Section 13 sets out recommendations and conclusions drawing on the answers to individual questions as well as considering how changes made to one area of the guidance could influence others.

Sections 3 to 12 are structured in the same way: first, the context is given by setting out what the current suite of guidance documents say. Second, the problem is identified drawing on evidence from each of the tasks. Each problem identified is given a ranking to reflect its influence on the approach used in the appraisal and the outcome (low, medium or high). Next, the causes of the problem are identified, identified mainly from Task A2 (structured feedback). The influence of each cause on the problem is assessed as low, medium or high. Finally, the potential solutions are identified and the ease of implementation of each solution is discussed in terms of what action would have to be taken and whether this is likely to be easy, moderate or difficult. Suggestions are then given on how to address the problem and thus answer the questions being considered.

The solutions provided in this report are tiered such that solutions are given to each problem and each cause of the problem on a question-by-question basis. These mainly focus on the 'easy' solutions but also look at whether implementing the 'easy' solutions would make it easier to then tackle some of the moderate or difficult solutions. The second tier of solutions is given at the end of each section, where a combination of solutions is given to address all of

the questions within that section. This allows synergies to be taken into account, where solutions implemented to address one problem can also assist with solving other problems. Combining solutions also encourages efficiency and, again, may assist with the implementation of the more difficult solutions. Finally, solutions are given in Section 13 of this report. These combine not just the solutions to individual problems and the combined solutions to each part of the appraisal process but for the overall appraisal process and the overall guidance. It is at this overall level that the most wide ranging changes are required but where most of the problems can be addressed.

## 2. The overall context

### 2.1 The context for the study

FCDPAG 1 (MAFF 2001) defines Project Appraisal as: “the process of identifying and then evaluating options in order to select the one that most closely satisfies the defined project objectives. In the context of flood and coastal defence strategy and scheme appraisals these objectives include:

- reducing the risks to people and to the developed and natural environment from flooding and coastal erosion;
- identifying a solution that is technically sound and most fit for purpose;
- being environmentally acceptable and sustainable; and
- ensuring best value for money from a national perspective.”

The approach to project appraisal in flood and coastal erosion risk management (FCERM) is based on this definition. However, the definition appears to focus on a comparison of defined options and does not *emphasise* the role of developing options through learning and feedback from the appraisal process, although the FCDPAG series does refer to the need to review options both during at the end of the appraisal process.

Making Space for Water (MSfW) clearly states the Government’s aim for flood and coastal risk management as: “to manage the risks from flooding and coastal erosion by employing an integrated portfolio of approaches which reflect both national and local priorities, so as:

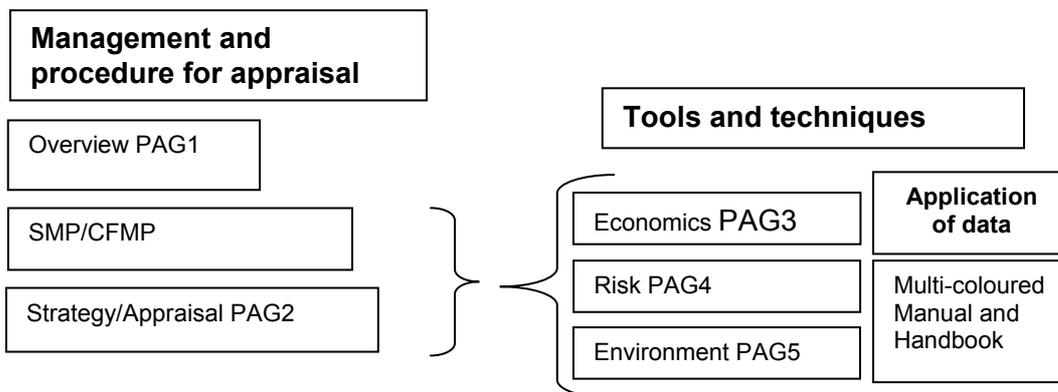
- to reduce the threat to people and their property; and
- to deliver the greatest environmental, social and economic benefit, consistent with the Government’s sustainable development principles.”

It is clear that appraisals are therefore central to achieving and delivering the Government’s aim.

This study, through consultation and reviewing and analysing existing guidance and appraisals, aims to provide a better understanding of the guidance that supports the appraisal process, how it can be improved to contribute to better decisions and be cost effective, in the quest to reduce risk and be consistent with sustainable development principles.

The intended structure of the current guidance and in particular the FCDPAG series can be seen less as a series running from 1 to 5 (as set out in the appraisal process diagram in Figure 3.1 of FCDPAG1), than as an overview (PAG1), a document setting out specific steps (PAG2) and a parallel series of techniques which should assist in the whole process (as set out in the more conceptual approach in Figure 2.1 of FCDPAG1). Guidance on CFMPs and SMPs contributes to the process in a slightly different way to the core appraisal process, although still draws on the techniques or tools and works to basically the same principles. The Multi-Coloured Manual and Handbook provide data

and define tools, and discuss where it might be appropriate to use them. The basic structure is set out in Figure 2.1, below.



**Figure 2.1 Structure of the guidance**

The results of consultation showed that some 80% of respondents (to the initial questionnaire) said that they are content with the current guidance. Furthermore, this study demonstrates that the guidance is both in line with Treasury guidance (see Section 4) and should in fact address some of the issues raised during the consultation phase of the study. However, other more detailed evidence collected for this project seems to introduce an inconsistency in this overall picture. At the same time as indicating a general contentment with the appraisal guidance, the evidence from all of the questionnaires (initial questionnaire, questionnaire from Members of the Public and detailed questionnaire), and from the workshops shows that:

- there is a quite strongly held belief that things are not working as they should;
- that there is often too much effort going into or expected from PARs; and
- that there is a concern that PARs are not necessarily facilitating the way towards appropriate decisions.

Therefore, it appears that people are not concerned so much with the principle, but rather more with the process.

The main body of this report focuses on specific issues of the guidance specifically raised in the brief. This section, in contrast, steps back from this detail to examine the overall context of the appraisal process. This sets the broader context of the study, but also examines and helps to interpret the apparent inconsistency in responses discussed above. In providing this context, the section initially considers where the appraisal process has come from, what the initial perceptions were and how these perceptions seem to have changed. This then allows examination of the different aspects that are now driving the appraisal process, providing the context within which to interpret the responses received during consultation, and from which the reviews were undertaken.

## 2.2 History of guidance for appraisal

In providing this context it is useful to consider how attitude, legislation and practice has developed. It is not the intent to provide a detailed specific and exhaustive commentary on this, but rather to identify what are considered to be the essential changes to set the scene for the emergence of current project appraisal.

Prior to the enactment of the Land Drainage Act (LDA 1930) for flood defence, and the Coast Protection Act (CPA 1949) for coastal defence, flood and coastal defence works tended to be carried out by individuals, local groups, by public subscription, more occasionally by local authorities and on occasion with central funding. The process tended to be ad hoc. The Acts started imposing a structure but also recognised the need for a more centralised overview, co-ordination, and with this funding. Permissive powers to act and duties to regulate were established, associated with an increasing awareness that, in general, management required a broader perspective.

From 1949 to the early 1980s, national funding was more regularly available for flood and coastal defence works. The focus of the works was generally on engineering solutions, with other related impacts only emerging as an issue over this period of time. In many respects, this period reflects a time of local management. While in many areas there was an increasing awareness of the need for a broader, longer term perspective to be taken, this was not really formalised until the late 1980s with such examples as the changes in the Memorandum to Scheme Approvals (1991) to the Coast Protection Act, the initial Project Appraisal Guidance (PAGN 1993), Water Resources Act (1991), Land Drainage Acts (1991 and 1994), Environment Act (1995), Shoreline Management Plans (SMPs) (1995) and Catchment Management Plans (which later became LEAPs). The change in emphasis was driven by two needs:

- the need for a much broader perspective to be taken; and
- the need for a more rigorous examination of options.

The more rigorous examination of options is still, at this time, being driven strongly by economics, supported by the development of the Red, Yellow and Blue Manuals, and subsequently, the Multi-Coloured Manual and Handbook. This emphasis on economics relating to a specific scheme is made in the 1991 Memorandum to the CPA: “The cost must be reasonable and benefits sufficient to justify the whole cost before grant” and again, “The scheme, as far as possible, be environmentally sympathetic”. Furthermore, it was stated in relation to the initial aims of the project appraisal guidance that what was anticipated was no additional effort in terms of complying with the guidance than a formalisation of what was existing good practice.

There has been a shift, therefore, in two respects into the late 1990’s and through to present. The first is a need for more robust examination of options, the second; associated with this, a far more integrated approach to considering impacts on the environment and socio-economics but also towards delivering environmental and social benefit. This shift has been progressive with further guidance being provided in term of the FCDPAG series (PAG 3; economics,

1999, PAG 4 and 5; risk and environment, 2000; PAG 1 and 2; overview and strategy, 2001), SMP2, CFMP guidance, CHaMPs, WFD, EIA, PPG20 and PPG25. With this has come an expectation of increased transparency and consistency, a move towards 100% grant funding of projects and the change in approach leading to Defra's strategy on Making Space for Water.

Furthermore, during the 1990s, there was increasing pressure on the public purse and a recognition for better long term planning of investment in flood and erosion risk management in relation to investment as a whole. Initially, this moved from funding availability on a yearly basis to the introduction of prioritising works nationally in 1997. This move towards long term planning has been accompanied by the improved recognition of the hierarchical framework of policy/ strategy/delivery and their inter-relationships.

There has been, therefore, a progression of thinking as well as guidance. At times, the guidance has needed to consolidate the natural change in practice towards a broader approach. At the same time, both policy and guidance have been leading the thinking, driven by change in national pressures and the expectations of the overall coastal community. It is in this context, presently culminating in Making Space for Water, that this study is set and against this context of evolution and broadening requirements that the reviews and responses have to be assessed and interpreted.

## **2.3 The context for consultation responses**

Why then is there 80% agreement with the project appraisal guidance and yet obviously strong antipathy towards what is being done? Three aspects were identified throughout the study. These aspects being:

- a confusion in relation to the purpose of the appraisal;
- the detail being required; or
- the need to go over old ground at different stages of the process.

There is clear interaction between these aspects but each will, as far as is possible, be discussed individually. In terms of purpose; the guidance as it stands identifies the need for the process to identify and then assess options in order to select the one that most closely satisfies the defined project objectives.

More fundamentally, however, is the distinction between whether the appraisal is to assist in making the most appropriate decisions in relation to the specific project or in relation to national affordability and longer term prioritisation of funding. These are two distinct purposes, which have become merged within the evolution of the process. In principle these two processes should or can be mutually compatible and in some respects this might now be addressed in research such as that being undertaken to look on who gains, who pays (i.e. Sugden's willingness to pay approach) and through the principles set out in the new strategy (Making Space for Water). However, at present, in practice, there is confusion in terms of what needs to be done in an appraisal, i.e. what needs to be done to make a specific decision and what needs to be done to gain approval for funding.

In terms of the appraisal itself, questions are raised as to what is required of a project appraisal, and what is the appropriate level of detail? A sensible decision on how to deal with a specific problem may be quite obvious, the alternative options being almost immediately resolved by little more than discussion. Within the national arena, however, where, in effect, there is greater competition, there is a perceived need to extract every ounce of benefit, a need to cross every "t"; where the effort was felt to be disproportionate to the local decision being made. Therefore, there is a risk of moving from what is best for the problem in hand, to how can the hurdle of appraisal and funding be complied with, potentially at the expense of the best approach to decision making at the specific level.

This leads on to the issue of detail, with respect to the need for consistency and the requirements, particularly for the use of specific tools in an appraisal. In several responses it was felt that there was a requirement being placed on those doing the appraisal by those approving the decisions. In several responses there was a feeling that the procedure was dictating the process, beyond that required in achieving a sensible outcome.

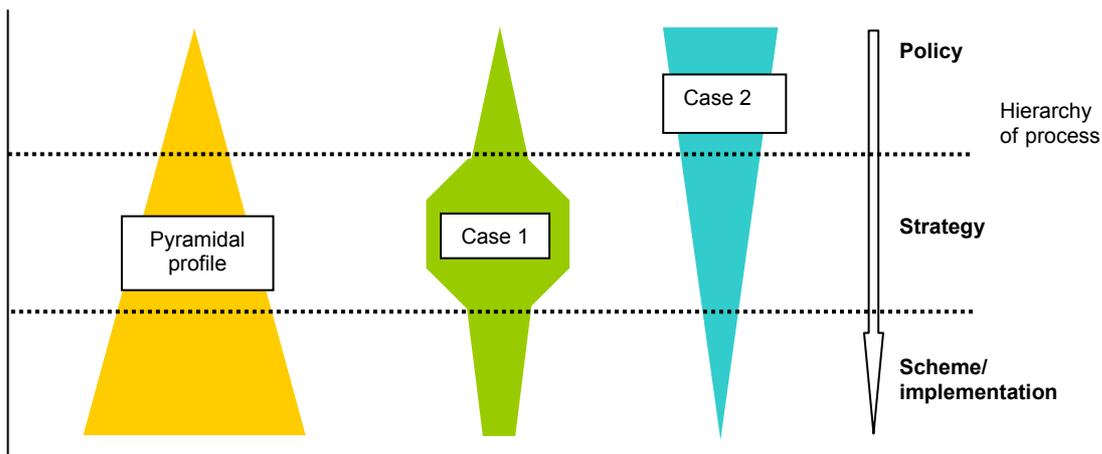
The approval process (in particular that of the National Review Group (NRG)) may well, and at present seems to, focus on the use of individual tools rather than on what is critical to the decision making process. In any specific case, the actual decision may be as much about technical design as it is about economics or environmental impact. The approval process, however, will require that the standard economic spreadsheet is correctly demonstrated in full, whereas the design calculation for say embankment stability is infrequently, if ever, demanded. There appears to be, therefore, an expectation by those within the approval process that the technical aspects are being carried out correctly, to an appropriate code, but that the often far simpler requirement of economics are being done incorrectly. Possibly this arises from the fact that if the embankment fails, the failure will be self evident. If the economics or assessment of impacts is incorrect there is little (or no) long term re-evaluation.

There is a perception that the choice of tools is being taken out of the hands of those doing the appraisal and is being demanded by those doing the approval. Although to a degree and specifically in relation to economics, this is one of the issues being addressed in the Multi-Coloured Manual/Handbook, it has not really filtered through yet to the industry, or been reflected in the requirements of those approving appraisals. Again there is the potential that, as this process of following a procedure dominates, this shifts the appraisal process to one of procedure rather than thought and argument, with the focus of what is needed to make decisions.

The issue of appropriate detail was also raised with respect to decisions being made at different levels within the hierarchy of management. It was suggested that at the highest level, the level of detail needed would necessarily be less; increasing as appraisals were undertaken at strategy level and finally at scheme level. Such an attitude seems to highlight a confusion as to the purpose of differing steps, and their need to address different issues.

The complexity of information required to make a choice varies through different levels; not necessarily, as suggested by some responses, being simply a case of more detail being required as one descends through the hierarchy (i.e. a pyramidal profile from policy through strategy to scheme, as illustrated in Figure 2.2). The detail or effort expended on the decision making process has to be dictated by the nature of the choices being made, rather than whether the decision is being made at the policy, strategy or scheme level. This is illustrated by two possible appraisals (Cases 1 and 2 on Figure 2.2) that would give very different profiles of effort/detail:

- in Case 1, an SMP may very simply assess the need for managed realignment (as opposed to hold the line, advance the line or do-nothing); requiring only crude justification, with subsequent analysis of the specific realignment involving significant effort in examining specific realignment options at a strategic level; and
- in Case 2, the determination of policy may require detailed consideration, with the ultimate choice of implementation, once a policy to defend has been agreed, requiring nothing more than a choice between materials (rock or concrete). It is too simplistic, therefore, to suggest that the complete appraisal process will necessarily form a pyramidal profile of effort (detail); given that the appraisal process is continuous throughout the hierarchy.



Level of effort (detail) – with greater effort or detail illustrated by a wider block of colour

## Figure 2.2 Level of effort required for different appraisals

It is also important to appreciate that not only are there different issues being addressed at different levels but the very nature of policy, strategy, implementation and then operations and maintenance are different.

Policy and maintenance may be seen as on-going processes, the initiation of a review is less as a result of a specific event or problem but rather something that needs to be programmed within each process. It is not for example a specific problem that requires the update of an SMP or CFMP but rather a need to review at regular intervals whether conditions or attitudes require a change in policy. The strategy and, even more so, the scheme appraisal tends on the other hand, to be driven by a specific issue. The principles of appraisal remain

the same regardless, but in one case the process is on a continuum, in the other the need for a decision is driven more by an impending change of state. This starting point of a specific appraisal was considered important in how one then used the process. This starting point essentially links into the recognised need for a more integrated approach between the different levels of decision making. It is from this appreciation that the question of going over old ground can really be resolved.

These issues help to interpret the responses received as a core element of the study but also reinforce the indication from consultation that there are matters, in terms of understanding where we are now, which go beyond the content of the current guidance.

## **2.4 The context for the reviews**

The historical perspective discussed earlier highlights the changing, evolving nature of the appraisal process. This has been important in reviewing guidance. While for example, considering the aspects of PAG3 on economics and comparing this in relation to other elements of the FCDPAG series, completed some two years later, or the Multi-Coloured Manual/Handbook, there have been changes in policy and changes in attitude or even practice, which have to be taken into account. It is interesting, therefore, to compare the FCERM suite of guidance against guidance prepared for appraisals in other fields (although the historical perspective associated with development of guidance and appraisal processes in other fields is not always known).

Similarly, the range of appraisals (PARs) reviewed also needs to be viewed within this context of change. Furthermore, the time taken for many of the appraisals and appraisal reports to be completed can extend across the changes being made, for example, changes to the discount rate and time horizon. Thus, taking a range of PARs from different time periods allows an assessment to be made (albeit qualitatively) of the impact of these changes (if any) on the appraisal itself (but only to the extent that this is reported in the PARs).

The study has attempted to resolve the context of change through reference to where there are already improvements or research on-going to address issues. There is also a recognition that in some respects there are broader issues beyond the strict remit of the guidance itself that have been identified and commented upon.

## **2.5 Interpretation and analysis**

Quite clearly from the discussion above, the study has had conflicting evidence presented in the various responses. In addition to those apparently contradictory issues arising from whether people are responding on specific issues, related to the mechanics of the appraisal in comparison to the principles being applied, there have obviously been contradictions between those actually

following the guidance (appraisers) and those more involved with determining the outcome of appraisals (approvers). In responding to an apparently simple question of whether the guidance is clear and understandable, this may inevitably invoke a response of “yes” or “no” depending on the perspective of the role.

The study has had to make judgements as to how these responses are dealt with in analysing the results and in reporting specific comment. This has involved careful targeting of consultation, in particular those invited to the workshops and critical review of comments received. Attendees at the workshops were senior people who are experienced in project appraisal and/or flood and coastal erosion risk management. Thus, they were able to provide real insight into what they perceived to be the problems with the current guidance, but also beyond this, into the current approaches to appraisal. The project team prepared workshop reports, which summarised all issues raised in the workshop. It was then necessary to sort these comments (also incorporating issues raised through questionnaires and reviews), to identify whether they were related to the guidance itself or to wider issues. Comments on the guidance were then further classified, identifying causes of problems, consequences and solutions and assigning these to appropriate steps within the appraisal process. Most comments were focused on the overall approaches, rather than specific areas/sections of the guidance. This highlighted that any changes that were likely to be required to the guidance were likely to be more than just amendments to the wording of particular sections or provision of supplementary guidance.

## **2.6 Summary**

This section has set the context for the study and the evidence presented in terms of the rapidly changing needs that have occurred over the last decade but also the change in attitudes.

Bearing this in mind, several key points emerge; in particular, the appraisal process is now seen as delivering choice on two fronts:

- delivering the most appropriate choice in any given specific situation (where initially this alone was the focus of appraisals); and
- determining whether a choice can be afforded, given the other demands on funding (based on availability of funding rather than the economics of whether a choice of option is justifiable).

There is an appreciation that a broader perspective is required to deliver the aims of Making Space for Water and while this broader perspective has been emerging, the guidance has had to evolve, in practice, to meet this need.

There needs to be a distinction drawn between the tools available to those carrying out appraisals and the principles and aims that the process is trying to achieve. In considering the responses received both from the questionnaires and the workshops, this distinction seems often to be blurred. There is an

indication from this, that the rigour of what is being expected is felt to be focussing on the procedure rather than the outcome.

There is a further distinction to be made with respect to the nature and detail required of different stages of the FCERM hierarchy. The guidance therefore has to be comprehensive to cover all levels and detail of the appraisal process from policy to scheme. It also has to be presented in such a way that it provides the platform for practitioners and decision makers to address FCERM in a consistent way to optimise not just the solution but also the effort.

The more detailed issues of the brief are addressed in the following sections.



## **3. Presentation of the guidance**

### **3.1 How is the current guidance presented?**

The current FCDPAG guidance comprises five volumes originally produced as soft back documents but now also in electronic format on the Defra web site. The FCDPAG series was published over a number of years commencing with PAG3 in 1999 and finishing with PAG1 in 2001. Each guidance booklet deals with a different subject but, due to the time taken to produce the series and the nature of developing/changing guidance over time, there is some overlap. For example climate change is considered in PAG3 with more up to date information in PAG1.

Supplementary notes to the FCDPAG guidance are published on the Defra website with individuals on the Defra FRM database being informed by email. Whether all those who use the guidance are aware of the notes is not known but from RPA's experience in providing training in project appraisal it would appear that knowledge of supplementary notes is not widespread.

The original SMP guidance was produced in booklet format but has been superseded by SMP2 guidance which has just been published (March 2006). It can be downloaded from the Defra website but is only being issued in hard copy to those directly involved in revising an SMP. The hard copy comprises Volumes 1 and 2 with appendices on CD.

CFMP guidance is on the SFRM website and can be accessed and downloaded only by registered individuals approved by the Environment Agency. The SFRM web site is managed by consultants and in addition to providing guidance and copies of completed CFMPs also provides a contact point for discussion.

The Multi-Coloured Manual can be purchased from Middlesex University and comprises a hard back book with text. This replaces the Blue, Red and Yellow Manuals which could also only be bought from Middlesex University.

The Multi-Coloured Handbook and CD (which also contains the depth/damage data) is being distributed free to selected individuals and organisations with further copies having to be purchased from Middlesex University.

The Project Appraisal Report Guidance was first issued by Defra/Environment Agency in electronic format. The Environment Agency incorporated it into their procedures and provides regular updates on their intranet site.

### 3.2 Is the guidance clearly presented, easily accessible and understandable and how can it be improved?

#### What is the problem?

Table 3.1 summarises the problems related to presentation and access to the current FCERM guidance documents, drawing on the findings of the questionnaires and workshops, in particular. The significance of each problem is also indicated in terms of how it affects the approach being used and its influence on the outcome of the appraisal. The table draws in evidence from consultation, the review of Project Appraisal Reports and the existing set of FCERM guidance.

**Table 3.1 What is the problem?**

Problem	Significance in terms of ...	
	Approach used	Appraisal outcome
Users of the guidance documents are having to spend time searching for the appropriate information and/or looking elsewhere	High	High
The guidance is not specific or clear enough in some areas meaning judgement is required, potentially leading to inconsistencies	High	High
Too much jargon	Low	Low
New versions of guidance arriving in the middle of a project	High	High
Perception that the rules are constantly changing	Low	High
Policy keeps changing and guidance has to catch up, therefore, is also constantly changing	Medium	High

Table 3.1 shows that many of the most significant problems relate to navigation through the guidance documents to find the information required and ways of ensuring that you are using the most up-to-date version of the guidance, supplementary notes, etc.

The next step is to identify the causes of the problem, in order to determine if the problem can be solved by changes to the guidance or requires other changes to be made.

#### What are the causes of the problem?

Most respondents (78%) to the detailed questionnaire stated that they had used the FCDPAG series. All of the respondents who had used the FCDPAG series had used FCDPAG3, while 79% had used FCDPAG1 and FCDPAG2. FCDPAG's 4 and 5 were the least used (57% and 50%, respectively). Of those using the FCDPAG series, 14% have no problems finding the information they are looking for, but 64% have to search for the information. A further 21% stated that they could not always find what they were looking for.

A total of 65% of respondents to the detailed questionnaire had used the FCDPAG3 spreadsheets, with three out of five using them on every project. All of those using the spreadsheets found them useful, with almost one-third of respondents stating they were fairly useful (with the need for considerable changes to them), half found them useful and one-fifth of respondents found the spreadsheets very useful, and a good template for economic appraisal. The reasons given for the spreadsheets being not very useful, useful or fairly useful are:

- they are only a template for the final stages of the appraisal. Every project is different which means that they have to be modified to fit the purpose of the project;
- they are usually ok as a basic template; and
- the spreadsheets omit some essential aspects of economic appraisal, e.g. capping of property damages, forcing users to create supplementary spreadsheets to do the additional calculations. The duplication of effort by each consultant and at each office is wasteful and risks an inconsistent approach.

No respondents said that they found the spreadsheets difficult to follow.

One respondent noted that there should be no requirement to use the spreadsheets.

There were few responses relating to use of the SMP and/or CFMP guidance due to most respondents not using these guidance documents. However, those who did use them stated that they often had to search for information or look elsewhere. Similar responses were received on the Multi-Coloured Manual (MCM), although the Handbook was found to be easier to use, with a much clearer layout (using colour coding), and greater use of tables making the information more accessible and easier to find.

The workshops raised issues in terms of the difficulty of navigating through the guidance due to its length and the fragmented nature of its structure. This often leads to the use of judgement that could result in inconsistency. Although an issue was raised in the initial questionnaire that there was too much jargon, this was not considered to be the case in the workshops.

More than two-thirds of respondents to the detail questionnaire (69%) agreed with the statement that the 'guidance is too long, making it difficult to navigate through and complex'. The majority considered this to be a quite or very important issue. It is also considered that the volume of material with which practitioners are expected to be familiar is growing and changing rapidly.

Respondents to the detailed questionnaire also highlighted problems of continuous changes. This was partly due to changes elsewhere in Government (e.g. the Treasury Green Book) and partly due to new information becoming available (e.g. new depth-damage data from the autumn 2000 floods, research such as on the health effects of floods). Guidance documents and supplementary notes are perceived as having been issued in a reactive manner, resulting in duplication and sometimes inconsistent information.

The majority of respondents (66%) indicated in the detailed questionnaire that there is a need for more worked examples. Reasons given included that the worked examples provided are outdated and the examples need to cover other situations.

Table 3.2 sets out the cause of each problem identified in Table 3.1. This draws on evidence from consultation, in particular the workshops and detailed questionnaire. The table provides an indication of the extent that each cause is driving the problem.

**Table 3.2 What are the causes of the problem?**

<b>Problem</b>	<b>Causing problem</b>	<b>Influence on problem</b>
Users of the guidance documents are having to spend time searching for the appropriate information and/or looking elsewhere	The guidance is too long/wordy/complex and is tending to get longer as it becomes more comprehensive and as it is revised	High
	The guidance is difficult to navigate through	High
	Complexity of linkages between documents, including a lack of clear scope of each guidance and how they link to other documents (no clear hierarchy or overall structure)	High
	Guidance is not user oriented, with a lack of distinction between the principles, concepts and practicalities	Medium
	Duplication of topics in different volumes of the guidance	High
	Confusion as to the different level of detail within the guidance (see Section 4)	High
The guidance is not specific or clear enough in some areas meaning judgement is required (objectives, approaches and output), potentially leading to inconsistencies	Guidance is fragmented and uncoordinated	Medium
	Guidance too often does not 'nail down' the issue, leaving a number of 'escape routes'	High
	Need for more worked examples around borderline issues – current examples are too obvious and are outdated	Medium
Too much jargon	Not considered an issue in workshops, but may require clearer presentation of glossary	Low
New versions of guidance arriving in the middle of a project	Delay in production of new guidance	Medium
	Difficult to identify what has changed and why	High
Policy keeps changing (or perception that there are changes) and guidance has to catch up, therefore, is also constantly changing	Appraisal process takes so long that guidance and policies have changed in the interim	High
	Never ending process continually adding on information, increasing the volume of information that practitioners have to be familiar with	Medium

Table 3.2 shows that the main problems relate to difficulties of knowing where to find a specific piece of information and then whether other information on the same subject is included elsewhere. There is also the issue of the guidance not providing full details on an issue such that it could be concluded that a particular area does not have to be covered or should not be covered, even where it may be important in the appraisal being undertaken (e.g. environmental and social issues, sensitivity analysis, etc.). The changing of guidance during appraisals is a significant issue that can require work to be repeated thus meaning that the appraisal takes even longer to complete, increasing the risk that there will be further changes.

These latter changes would, however, appear to relate as much (or possibly more) to the format or presentation expected of an appraisal rather than changes to the basic concepts or rules within the guidance itself. It is evident, therefore, that there is some confusion between the intent of the guidance to provide a set of good practice principles and tools for undertaking an appraisal, a technical approach to assessing appropriate solutions and decision making, and the required output of this process in terms of its presentation and content for review. The comment “that there should be no requirement to use the spreadsheets” not “that there should be no example spreadsheets in the guidance” exemplifies this distinction between guidance on process and guidance on output. This issue is developed further in Section 4.

The next step is to consider what solutions are required to tackle the causes of the problems.

### **What are the solutions?**

Table 3.3 sets out potential solutions for each cause and each problem. Some of the causes require more than one solution, or have alternative solutions. For each solution, action that can be taken is described with the ease of implementation also given (ranging from easy to difficult). Where possible, the solutions are linked to existing process or appraisals. Evidence of the solutions is drawn from consultation, and from the review of guidance documents and appraisal processes used in other fields. The review of PARs is also used where one (or more) PARs have included impacts that could not be easily valued, as these suggest that approaches are already available that could reduce or remove the problems.

When asked in the detailed questionnaire if the presentation of the FCDPAG series needed to be improved to make it easier to find specific information, 43% answered yes. The same number of respondents (6) answered no, with a further two stating that they did not know. Comments on how to improve the presentation were:

- online access with links to specific information and similar information;
- online access on dedicated appraisal web-site; and
- printed format similar to current.

One of the respondents added *‘Hard copies are always useful for reading. However, sources of information are changing more rapidly than the guidance.*

*Documents and references need to be kept up-to-date to avoid time-wasting searching for information that has been superseded or moved (e.g. Index of Multiple Deprivation is no longer produced)[...] An idea is to produce a ring binder with dividers and loose-leaf insert, which can be updated one sheet at a time if necessary'.*

In terms of the FCDPAG3 spreadsheets, 42% stated that the presentation could be improved. A further 25% said that the presentation is ok as a guide and should not be improved. The changes suggested to make the spreadsheets more useful include:

- inclusion of one input page only and then develop an 'automatic' spreadsheet;
- inclusion of more clearer linkages between each of the spreadsheets, automatically updating but also explaining in the text what has been done; and
- clearer guidance, flowcharts and explanations, for instance on the use of summary Average Annual Damage (AAD) versus Present Value (PV) losses, with clear examples of common types of scheme.

More detailed changes suggested include:

1. Replacement for ESTDAM: a new spreadsheet to calculate property damages, linking with the MCM depth-damage data spreadsheets would be useful.
2. Toolbox incorporating all common economic appraisal calculations: to avoid the need for practitioners to adapt the spreadsheets to meet the requirements of current guidance. Features might include: capping of property damages and reduction for flood warning; and
3. Toolbox for cost estimation: would help to bring some consistency. Research, guidance and data for cost estimation is disproportionately low compared to that available for benefit calculations and is the weak link in project appraisal. Guidance on cost estimation similar to the Multi-Coloured Manual would be useful, particularly for practitioners who are not civil engineers. A selection of estimating methods and database of unit rates for use at different stages of appraisal would be helpful.

It is interesting that many of the proposed changes require further automation of the appraisal process, which could be seen as a move towards a more 'black box' approach and this may be further examined through the actual workshop discussions. Those advocating further development of the spreadsheets appeared to feel that greater automation and additional function would both ensure that simple errors were not made while increasing the flexibility of the spreadsheets in dealing with different situations. Those suggesting no further change appeared to feel that no amount of additional function would necessarily allow coverage of all conditions and that the current spreadsheet provided an adequate baseline or example from which to develop an appropriate economic case. Neither group, therefore, felt that the existing spreadsheets provided a definitive approach to economic analysis in all situations. There was general

agreement that it is essential in economic appraisal that the user of the guidance and any accompanying tools, understands how the process is working such that they can identify where there are likely to be sensitivities or errors.

Table 3.3 shows that there are possible solutions to all of the causes of the problems. Many of these solutions require other actions to be put into place such that the changes will take time.

It may be possible to implement a 'quick-fix' solution by identifying the linkages between the various guidance documents such as a consolidated index. However, this would not deal with the issue of duplication, although it would be easier for a user to find all of the information on a specific topic.

More appropriate would be to reconsider the structure of the existing guidance documents and to generate a new guidance. This would need to begin by separating what are 'rules' from what is process (or good practice). The rules would be those aspects of the appraisal process that need to be followed (or where good justification is needed for diverging from them) and could include the requirements for presenting the output of the appraisal in a consistent manner. This is supported by responses to the detailed questionnaire, in which 70% stated that splitting the guidance into policy and process guidance would be helpful. Reasons given include:

- approvers, project managers and appraisers are interested in different aspects;
- potential to clarify what is policy and what is process, which has caused misunderstandings in the past; and
- the documents would be more manageable and address different sets of questions.

Both the rules and process documents can be kept concise by providing information at three different levels of detail:

- overview level: setting out key information that an experienced user may need to check when undertaking an appraisal. This would be best structured as a series of tables or concept diagrams with minimal text;
- detailed level: supporting information providing more information on the tables provided in the overview level, for example, where a user is looking at a project that is slightly different from the norm and needs to know how/if particular information should be used in that case; and
- explanation level: information explaining how and why particular information is provided, where it comes from and what it was developed for. This should be aimed at those who are less experienced, providing an understanding of how and why to use information, but also at those who are examining how standard approaches may need to be adapted to specific situations

The structure of both the rules and process documents should be developed both to reflect the whole life management framework (policy, strategy implementation and operation) and, within this, around the steps in the appraisal process. This makes it easy to follow and should also help encourage a more systematic and systemic approach to undertaking appraisals. It is

recommended that an easy to update format is used, such as on-line or searchable pdf documents, and where links can be included to allow a user to quickly move from one piece of information to another. The revised guidance would need to be structured in a hierarchy, for example, with an overview document at the top level setting the concepts, principles and logical framework to be followed for any appraisal. The next level could deal with guidance for carrying out particular levels of appraisals such as CFMP/SMP, strategy and schemes. This level can then be supported by a set of additional good practice approaches/tools which will need to be referred to and labelled as such. This could take the form of a project appraisal website/search engine containing a list of all guidance documents and index of topics. Links could also be included to worked examples, for example, where a ‘good’ appraisal has addressed a particular problem (such as inclusion of environmental and social impacts). This would allow the ‘good’ appraisals to also form illustrative examples. It will be important that the process document is emphasised as guidance/good practice to help avoid people using the examples as templates. It may also be useful to break down the examples into their component parts, such that there is not a complete PAR to follow but instead the steps of the appraisal are illustrated. This again should help avoid examples becoming templates.

If on-line documents are provided, they should also be downloadable as whole documents so they can be easily read (e.g. a project appraisal handbook). Some of the guidance documents reviewed as part of Task A1 were only available on-line and could not be downloaded which is not helpful to those who do not have Internet access on their desktop (or other machine that is being used to undertake the appraisal). It also means that the guidance can only be viewed while on-line, which can be somewhat inconvenient at times. A Word version of the guidance could also be produced with version numbers and hyperlinks that can be kept in a loose-leaf file for easy updating. This may be most useful in offices where a number of people require easy access to particular sections of the guidance.

**Table 3.3 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
The guidance is too long/wordy/complex and is tending to get longer as it becomes more comprehensive and as it is revised	Guidance should be as short as it can be to deliver the essential requirements of the appraisal	Tiered approach, providing overview, with additional detail available as required	Moderate to difficult – need to identify what goes in each tier

**Table 3.3 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
	<p>There should be an aim to reduce the length, but also the general feeling that the PAG series is well written and very useful</p> <p>The guidance should focus more on making clear what the appraisal is trying to achieve. The logical steps/gateways through which it should be approached (not detailed procedures) what is required for an appraisal to be acceptable and very importantly, what outputs need to be covered. References to good practice can be included to support but not lengthen or confuse/complicate the documents or constrain innovation</p>	<p>Review of key sections to identify duplication between different documents OR start again structuring guidance around steps in appraisal process using tiered approach giving different levels of detail</p>	<p>Moderate to difficult – need to retain current information but simplify, need to revise linkages OR need to start over, redesigning from outset</p>
	<p>Need for guidance to be linked to decision criteria. The decision criteria need to be linked to the achievement of the objectives of the appraisal and MSfW and not restrict in terms of ability to monetarily value damages/benefits, etc. This will also require clarity about what the objective and scope of each one is as well as their links need to be clearly illustrated within each document</p>	<p>Revision of guidance so it mirrors approach to appraisal and development of a logical sequence of the required suite of appraisal guidance, which can then be tailored to decision-criteria</p>	<p>Moderate – links to decision criteria would be relatively simple if guidance is structured around appraisal process</p>
<p>Duplication of topics in different volumes of the guidance</p>	<p>Need for consolidation of guidance, removing duplications where appropriate and providing better linkages between guidance (see below)</p>	<p>Review of key sections to identify duplication between different documents</p>	<p>Easy to moderate – need to retain current information but simplify, need to revise linkages</p>
<p>The guidance is difficult to navigate through</p>	<p>Need for clearer linkages</p> <p>The current structure does not make it easy to identify which documents provide which aspect of what one wants or to find what one wants within particular documents</p>	<p>Use of different medium – e.g. online where linkages could be included within the document, or pdf to allow for easier searching</p>	<p>Moderate to difficult – need for guidance to be reviewed first, then on-line guidance set up (review will need to identify all links required)</p>

**Table 3.3 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
	Guidance needs to be aimed at different levels, and to provide common overarching guidance that is applicable to all, and detailed guidance recognising the differing objectives for each level within the decision hierarchy	Use of tiered approach, simple overview level with ability to obtain extra information from more detailed levels as appropriate	Moderate to difficult – guidance needs to be reviewed first then need to identify what goes into each level (what is overview, what is detailed?)
Complexity of linkages between documents, including a lack of clear scope of each guidance and how they link to other documents (no clear hierarchy or overall structure)	Need for clearer linkages (as above)	Need for easily searchable format, e.g. on-line, pdf	Moderate to difficult – need for linkages to be identified and built into new form of guidance
Guidance is not user oriented, with a lack of distinction between the principles, concepts and practicalities	Need for a prescriptive element setting out the rules/outcomes (what you have to do, as opposed to the how). This should be separate from the tools	Need to separate rules from process (the process should be presented more as good practice), but keep alongside one another. Would require simple presentation method so it is obvious which is which	Moderate to difficult – how to separate rules and process but still make sure everyone can follow both
Guidance is fragmented and uncoordinated	Needs to be clarification on what is procedure and what is rules (see above)  More clarity and separation of the concepts, principles and practicalities within each document. Again, clear hierarchy and links between documents	Separate policy and process guidance may help, but need to make sure both are considered during an appraisal	Moderate to difficult – policy document would have to be kept up-to-date
Guidance too often does not ‘nail down’ the issue, leaving a number of ‘escape routes’	Again, needs to clarify what is mandatory and what is guidance/good practice	Need to keep mandatory document as concise as possible so it is like a checklist	Moderate to difficult – need to cover all levels, etc. and ensure reasons for rules are understood

**Table 3.3 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
	Need for worked examples demonstrating the process (not a process to be followed in every situation)	Need to draw on actual appraisals (PARs) to ensure they are not too simple	Moderate – requires determination of ‘good’ appraisals for a range of situations and making these known and available
Need for more worked examples around borderline issues – current examples are too obvious and are outdated	Need for illustrative examples, perhaps a library of good appraisals containing projects at different cost levels to encourage learning through good examples and need to be updated every time the guidance is revised	Library of good appraisals needs to be readily accessible, e.g. on-line otherwise will take too long to get	Moderate – needs record of good appraisals to be kept and continually updated/amended as appraisals ‘improve’
Jargon - not considered an issue in workshops, but may require clearer presentation of glossary	Production of an overarching glossary	Bring together existing glossaries	Easy – glossaries are already written
Delay in production of new guidance	Need for programmed and planned approach to reviews and updates so everyone is clear what is going to happen and when  Removal of the procedural ‘how’ aspects from the main guidance will reduce the need of overly frequent changes as good practice approaches are ever evolving	Need for agreement on appropriate time period over which changes would not be made (e.g. 3 years). This period would be used instead to collect and collate comments and feedback on existing approaches with a view to making improvements at the end of the review period	Moderate to difficult – needs Defra, Environment Agency and all other stakeholders to accept that things may not be perfect for the first review period, but to work within the rules set. It would however, be assisted using a tiered approach, distinguishing between the immutable and the imperative and that which is still developing
Difficult to identify what has changed and why	Need for updates to replace old text, with changes clearly highlighted	Revised text needs to be marked or highlighted	Easy – requires changes to be emphasised when reissued

**Table 3.3 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
Change in perceptions of those undertaking appraisals and those reviewing appraisals	Need for changes to only be made once revisions to guidance has been issued	Need for those undertaking appraisals to be content with providing feedback and comments in the interim. This would only apply to the rules with innovation fully acceptable within the good practice guidance	Difficult – natural temptation is to try to improve, but allowing innovation in process (rather than rules), with formal feedback and comments should help. This would again be assisted by a tiered approach
Appraisal process takes so long that guidance and policies have changed in the interim	Need for simplification of whole process so that this is less likely. Those appraisals that are likely to be underway when revisions are due should be included on consultation on any changes to assess the potential impacts	Requires major revision of appraisal process and guidance, going back to principles of why the appraisals are being undertaken in the first place	Difficult – requires a lot of changes to be made to process and attitudes. Will require consultation and training to encourage buy-in, as people generally do not like change
Never ending process continually adding on information, increasing the volume of information that practitioners have to be familiar with	Need for separation of rules and process, to allow judgement to be exercised and appraisal based on uncertainty and risk rather than need to complete PAR	Links to need for programmed review process on rules that will avoid addition of extra rules until end of review process (during which any changes will be fully consulted on)	Moderate – linked to programmed approach should help reduce this attitude, but Defra/Environment Agency will need to avoid the temptation to make changes during the review/feedback period

### 3.3 Overall solutions

This Section considers possible solutions to deal with issues with the current presentation, accessibility and updating of the guidance. The proposed solution is to:

- separate the rules from the process and have two separate documents, but which are structured in the same way (based on the steps in the appraisal process). This would help address navigation difficulties and would help different users of the guidance identify their particular areas of interest;
- develop tiered guidance providing overview information (similar in principle to the MCH), with additional detail and explanation provided where needed.

This would allow users to obtain information according to their level of expertise, with experienced users able to quickly locate key information, but provide additional explanation for those with less experience;

- the issue of hierarchy and links and significant restructuring of the entire guidance suite should be addressed to ensure consistent understanding of overall objectives principles and requirements, while having detailed guidance or each level of decision. This will ensure that appraisal guidance is based on consistent principles, while remaining objective-led;
- to present the information in such a way that it can be easily searched and includes links between appropriate sections of the guidance (most importantly the rules and process). This may be best done using an on-line version of the document with hyperlinks. This could include links to sections of 'good' appraisals to act as illustrative or worked examples of specific processes. Such changes could reduce the apparent length of the guidance, hence, improve efficiency of use, encouraging users to refer to the guidance when undertaking appraisals; and
- maintaining the guidance 'as is' for a predetermined period (possibly three years), during which time no changes would be made to either the rules or process, but where feedback and comments could be provided in preparation for an official review period. Users would be able to supplement the process guidance with new approaches, but the rules would be set, such that they are followed by all users. This would remove the perception that the rules are constantly changing and allow time for users of the guidance to become familiar with the revisions. Furthermore, concentration on making as clear as possible the 'what' and including as much as possible reference to good practice tools and methodologies on the 'how' would provide a better approach to structuring a guidance that will not need changing too often.

Implementing all of these changes would require the guidance to be significantly restructured. There are smaller changes that could be made (such as developing a consolidated index highlighting linkages between guidance documents and making this available on-line). However, this would not provide solutions to all of the issues (e.g. duplication of information, the length of the guidance or the hierarchy). As a result, small changes may only provide short-term solutions with the remaining issues becoming increasingly important over time.



## 4. The level of detail

### 4.1 What level of detail is required by the current guidance?

The approaches/detail at different levels of appraisal; large scale, strategy and scheme appraisal, are discussed in FCDPAG1 (S2.2) without defining what this level of detail is: *'At each level, all the potential impacts and options are considered to an appropriate level of detail and geographical scale to ensure good decision making and option selection'*.

Again in FCDPAG2 (S3.4.6 & 7) the level of detail for costs and benefits is stated as: *'appropriate to the strategic decision'* but without any guidance as to what this may be. However, it does give an indication when a more detailed approach would be required: *'Where a decision between very different approaches is finely balanced, the costs and benefits may have to be evaluated in detail. In other cases there may be greater scope for refining cost estimates at detailed scheme appraisal stage within a broader range of strategic options.'*

FCDPAG3 gives more detailed guidance on the level of detail for costs and benefits (S3.7) as follows: *'Benefit–cost analyses need to be undertaken for different types of decision making as well as in progressively greater detail as a particular project develops. Strategic plans need to involve an economic appraisal to identify, for instance, those areas where protection is likely to be justified and those areas that could be sacrificed. For projects involving a small amount of expenditure, a detailed benefit–cost analysis may not be economically justified. Decisions are, therefore, required as to what level of detail is appropriate, which streams of benefits and costs to include and how much is to be spent on the analysis.'*

Regarding the extent of risk assessment, FCDPAG4 states that the risk approach should suit individual applications (S1.1). It also states that: *'It provides guidance for all levels at which relevant decision making is addressed, namely:*

- *large-scale planning;*
- *strategic planning;*
- *scheme appraisal;*
- *scheme design;*
- *scheme construction and maintenance.'*

However, the guidance is mainly referring to what approaches and tools could be appropriate at different decision levels.

There are no specific references to levels of detail in FCDPAG5.

The CFMP guidance refers (Vol 1 S5.3.3) to the need to use high level techniques and identifies the need for a broad appreciation. There is no description of the level of detail appropriate to 'high level' or 'broad'.

SMP2 has a section on the appropriate level of detail (Appendix C) but this is very general and relates only to maximising the use of available information. Both CFMP and SMP2 guidance includes the use of MDSF for calculating benefits, therefore the level of detail is set by the inputs required for MDSF. SMP2 does state that: *'it is important that the consultees are aware that the SMP will take a broad brush view on coastal issues and that detailed information will generally not be required'*.

In relation to the level of detail for benefits the MCM (Ch1) states that: *'At each stage we can use more and more detailed or complex economic methods, commensurate with the worthwhileness of this greater precision'*. There is also reference to increasing levels of detail required from broad scale analysis through strategies to works appraisals.

The MCH does not refer to detail but does consider the dimension of time and resources allocated to those parts of the benefit assessment process that are most important (Ch1):

- *'Concentrating on those components of total benefits which are the largest compared to the effort expended on assessing them...'*
- *'Ensuring that the data on which the benefit assessment depends is most accurate (or least inaccurate) where it has most effect on the final results...'*

The Project Appraisal Report Guidance refers readers to the FCDPAG series in the sections on costs and benefits (S2.4 & 2.5).

## **4.2 Is the level of detail provided appropriate for users' needs?**

### **What is the problem?**

There are two aspects to this question. The first relates to the level of detail in the current suite of guidance while the second focuses on the level of detail required in an appraisal. The main problem identified while undertaking the tasks is that the guidance does not give much information on the level of detail at which an appraisal is to be undertaken. Thus, it is this aspect of the question that is focused on here. Issues related to specific areas of the guidance (and the level of detail provided) are covered in the appropriate questions, below (such as screening in Section 7, environmental and social impacts in Section 8, sensitivity analysis in Section 9, decision-making in Section 11, etc.).

Responses to the detailed questionnaire suggested that, generally, users are happy with the content and format of the FCDPAG series. FCDPAG3 is the volume most commonly used on every project, often to look up specific information. The majority of respondents (64%) found that they had to search for information in the FCDPAG series, with 27% not always being able to find that they wanted. The SMP and CFMP guidance were used by a much smaller percentage of respondents (just 26% and 13%, respectively had used the guidance documents). Of these, most found that they needed to obtain information from elsewhere.

Respondents to the detailed questionnaire were also generally in agreement that the guidance is too long, making it difficult to navigate through and complex (see Section 3 for a fuller discussion on the implications of the length of the guidance).

In many respects the responses reflect the confusion in understanding, possibly generated by the requirements of those approving appraisals, that there is a uniform level of detail required; and a required use of tools.

Only five out of the 67 PARs reviewed explained why they had used a particular level of detail. Of those giving reasons for the level of detail, this mostly relates to specific areas of the appraisal (e.g. costs) rather than for the whole PAR or because information has been taken from other plans, strategies and schemes.

The workshops showed there to be a lot of confusion as to the appropriate level of detail required at each level of appraisal (SMP/CFMP, strategy, scheme). This is, in part, due to a lack of a definition in the guidance on what should be undertaken at each level, but more importantly by a lack of willingness on the part of those doing the appraisal to argue the case. The result is that appraisals are going into ever increasing detail, driven by the expectations of those approving PARs, as much as or more than by the requirements of the guidance itself. This means that the appraisal process has become very detailed, resulting in high costs and large demands on resources. There is a particular issue for small schemes, with increasing concerns that judgement on what to include or not include can no longer be used. This again suggests that the decision as to what is needed is becoming less about the decision to be made and is being driven by procedure.

Responses to the detailed questionnaire showed that 82% agreed (36% completely and 45% partly) that the level of detail to be included in an appraisal was not clear. However, only three respondents (34%) believed this was mainly a guidance issue, with no respondents indicating that it was due to the guidance alone. Comments on the current level of detail provided include:

- guidance covers all levels of study from strategy to PAR, but MCH is the only document to set out a recommended approach for each stage; and
- the level of detail has in the past been driven by the client and Defra, leading to wide variation in requirements.

This raises another issue – that of the expectations of approvers and stakeholders. A total of 75% of respondents to the detailed questionnaire agreed that the expectations/aspirations of what an appraisal should include are too high. Comments included:

- cannot achieve the highest quality for the lowest budget, unless we develop more efficient processes;
- uncertainty is forgotten when selecting the level of detail at which the appraisal should be carried out; and
- practitioners, approvers and stakeholders forget that the appraisal should only guide decision-making, it should not provide a decision.

However, most of the respondents (78%) thought this was a wider issue, with no respondents indicating that it was a guidance issues alone (11% thought it was both wider and due to guidance, but mainly guidance).

Table 4.1 summarises the problems related to the level of detail provided. The significance of each problem is also indicated in terms of how it affects the approach being used and its influence on the outcome of the appraisal. The table draws in evidence from consultation and the review of Project Appraisal Reports and the existing set of FCERM guidance.

**Table 4.1 What is the problem?**

Problem	Significance in terms of ...	
	Approach used	Appraisal outcome
There is a lack of definition on what should be undertaken at each level	High	Medium
There is uncertainty on the level of detail required at different levels (SMP, strategy, schemes)	High	Medium
Appraisals cost too much and take too much time due to appraisal process becoming too detailed	High	Medium-Low
NRG is driving the appraisals into more and more detail	High	Medium-Low
There is uncertainty on the level of detailed required for small schemes	High	Medium-Low

Table 4.1 shows that the drive to greater and greater detail is having a significant effect on the approaches that are being used. This is leading to increased costs but may not be having a major effect in terms of improving decision-making, i.e. the additional detail being collected and assessed is not changing the decisions that are being made. This issue is raised and discussed in the recent Defra R&D project FD2023 (Improving Data and Knowledge Management).

The next step is to identify the causes of the problem, in order to determine if the problem can be solved by changes to the guidance or requires other changes to be made.

**What are the causes of the problem?**

Table 4.2 sets out the cause of each problem identified in Table 4.1 as having an effect the level of detail being appropriate for the users needs. This draws on evidence from consultation, in particular the workshops. The table provides an indication of the extent that each cause is driving the problem.

**Table 4.2 What are the causes of the problem?**

<b>Problem</b>	<b>Causing problem</b>	<b>Influence on problem</b>
There is a lack of definition on what should be undertaken at each level	There is a lack of guidance on the level of detail that is appropriate, what should/should not be included and when to stop	High
There is uncertainty on the level of detail required at different levels (SMP, strategy, schemes)	There is confusion as to the difference between plans/strategies and PARs	Low
	Guidance has been developed in an accretionary fashion, by different authors	Medium
	Lack of understanding as to what the appraisal informs, how it is to be used and who makes the decision	High
	Lack of linkages between plans, strategies, etc. There is often no evidence that previous documents have been referred to (23 of the 67 PARs did not refer to other plans, strategies or schemes)	Medium
Appraisals cost too much and take too much time due to appraisal process becoming too detailed	The Environment Agency is driving for more and more detail, with no decisions being made at an early stage, mainly due to risk aversion	High
	The appraisal process is getting bigger, not more focused	High
	Expectations of what will be provided are high (from project managers to approvers and stakeholders)	High
NRG is driving the appraisals into more and more detail	Approvers do not understand the issues, leading to pressure for ever greater clarity – any weaknesses tend to result in a PAR being sent back for review, even if this does not affect overall decision-making	Medium
	No guidance on who is making the decision and inconsistencies between CFMPs (which go to RFDCs) and PARs (which go to NRG)	Low
There is uncertainty on the level of detailed required for small schemes	There is no appropriate guidance for small schemes	High
	No allowance for judgement as to when an appraisal should/should not be undertaken	Medium
	Small schemes have to go through too many hoops, driving up the costs	Medium

Table 4.2 shows that the main problems are linked to a lack of information on what should be included at each level and then on the level of detail that is appropriate. This is resulting in a requirement for more and more detail to avoid the risk that the decision may be ‘wrong’, rather than the decision-making process driving the level of detail. In the latter case, more detail is obtained

where a decision cannot be made between two or more options (e.g. because of inherent uncertainty which additional detail will not resolve).

The next step is to consider what solutions are required to tackle the causes of the problems.

### **What are the solutions?**

Table 4.3, at the end of this section, sets out potential solutions for each cause and each problem. Some of the causes require more than one solution, or have alternative solutions. For each solution, action that can be taken is described with the ease of implementation also given (ranging from easy to difficult). Where possible, the solutions are linked to existing process or appraisals. Evidence of the solutions is drawn from consultation, and from the review of guidance documents and appraisal processes used in other fields.

Table 4.3 shows that there are possible solutions to all of the causes of the problems. Many of these solutions require other actions to be put into place such that the changes will take time. Most of the respondents to the detailed questionnaire believed that the lack of clarity on the level of detail required was an important or very important issue and that well-defined standards would ensure that an appropriate and consistent level of detail was used at each stage of appraisal. Some of the changes proposed include:

- more explanation aligning FCDPAG3 and the MCM is required;
- clear statements from NRG on what is required; and
- “project appraisal standards” are required, setting out the range of methods available and which methods would be acceptable for each level of study or stage of project. This could take the form of a matrix or table, indicating the type of model required, level of modelling accuracy, methods of estimating costs/benefits/freeboard, etc.

While there are a number of small steps that could be taken to reduce some of the issues in terms of details, it is more likely that the guidance needs to be significantly restructured, in particular including early definition of critical aspects of choice. Small benefits could be achieved by developing a definition of what each plan, strategy, etc. is for, description of the responsibilities of the parties involved (project manager, appraisers, approvers, stakeholders, etc.), and what should (and should not) be included at each level. However, there is the potential that developing such a document could highlight a number of difficult (and potentially conflicting) problems. For example, inconsistencies in current approaches may mean that some would like to see certain aspects of the appraisal included in one level, while others believe it should rightly go into a different level. Similarly, approvers and project managers could use it as an opportunity to try and push for greater levels of detail, with appraisers pushing for simpler approaches based on greater flexibility (or using ‘their’ methods, rather than those used by others to try and gain some commercial advantage). The ultimate responsibility for determining whose comments and opinions should be used may also be contested between Defra and the Environment Agency, but IDBs, local authorities and members of the public will also have to be involved.

A more comprehensive approach could be taken, but this is itself not without difficulties. There is the potential to develop a new set of guidance building on many of the comments and proposed solutions coming from the workshops. This would involve a complete review of how appraisal is undertaken, with a change in emphasis from the aim being to complete the Project Appraisal Report and obtaining funding to one of using appraisal to show what the 'best' solution is. Such a change in emphasis would allow the decision-making process to drive the level of detail required, with further detail only obtained where there is considerable uncertainty in the choice between two (or more) options. Consideration, therefore, needs to be given initially as to the critical criteria for choices being made and subsequently argument developed within the appraisal for the need to explore more detail. There is felt to be potential for quicker, more streamlined approaches providing the same preferred answer much faster and at less cost. The concern of respondents could also be reduced if it is recognised that the detail required is that which is necessary to argue the case, based on establishing the critical issues and what is required to allow an appropriate choice to be made.

The review of appraisal processes used in other fields does provide some evidence that such approaches can be followed. For example, guidance by the Strategic Rail Authority (2003) specifies that the level of detail should be 'commensurate to the scale of the proposal, and the risk to the SRA budget... There can be no hard and fast rules for the degree of appraisal detail required at different stages... It will depend on factors such as the scale and complexity of the project, the distribution of risks..., time constraints, and the cost of acquiring additional information'.

UKCIP (2003) proposes a tiered approach to appraisal, where the first tier is based on a systematic qualitative analysis. Here the size, significance and relative importance of the risks, costs and benefits for each option are described. Tier 2 involves a semi-quantitative analysis, where some aspects of the risks, costs and benefits are assessed quantitatively and other qualitatively.

Guidance to meet the change in emphasis would be best developed in association with those who will apply it but also those who will review the appraisals. This not only allows comments and feedback to be obtained early on, but encourages buy-in of the whole process. However, it is also much more time consuming and, given the large number of stakeholders involved in FCERM, could require a lot of workshop type opportunities. Again, there is the potential issue of conflicting comments. Nevertheless, there is no reason why a new set of guidance could not be tiered, with summary guidance available for experienced practitioners through to detailed guidance setting out explanations why things are done to help less experienced staff understand and learn why the process is the way it is.

Development of such guidance may be time-consuming and expensive but there is the potential for significant cost savings once the guidance has been prepared. Such savings will occur, for example, from better, more streamlined appraisals that themselves cost less to produce, the potential for training of eventual users and approvers during development of the guidance, thus

avoiding the appearance of something new, and guidance that is tailored to the needs of the users, thus is much easier and quicker to apply.

**Table 4.3 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
There is a lack of guidance on the level of detail that is appropriate, what should/should not be included and when to stop	Guidance needs to provide a clear explanation of how to assess what is needed at each level, what is to be dealt with at each level and what needs to feed down to inform lower levels. The appropriate amount of detail is to be driven by the issues that need to be addressed	Will require a very clear definition of what each level is to do, with clear guidance on choice making	Easy to difficult Change in attitude where the onus is on those doing the appraisal to argue the critical aspects of choice
There is confusion as to the difference between plans/strategies and PARs	The different stages need to be defined, with overlaps and differences highlighted. A better structuring of the Guidance into rules and tools, with stronger emphasis on the concepts of decision making and its application to individual situations	Clear structure for the appraisal process	Moderate – how to move away from current misconceptions
Guidance has been developed in an accretionary fashion, by different authors	Guidance needs to be completely reviewed with a plan at the outset of what is to be included and where, strong links between different parts of the guidance and involvement of the eventual users in development of the guidance	Will require good project planning and an appropriate timeframe to get it right first-time (allowing for iterations during development)	Moderate – will require a flexible timeframe to allow users to be fully involved, comments, trials, etc. But guidance also needs to be kept simple and short!
Lack of understanding as to what the appraisal informs, how it is to be used and who makes the decision	Clarification of the aims of each level, the target audience, the users, etc.	Will link to revised guidance on levels, definitions, etc.	Moderate – but will need to be incorporated into new guidance

**Table 4.3 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
Lack of linkages between plans, strategies, etc. There is often no evidence that previous documents have been referred to	Stronger emphasis on 'learning' during appraisal, not just within the appraisal but learning from studies previously undertaken. Encouraging better explanation of intent, rather than purely outcome. Likely to require good records of appraisals, library, etc. to prevent loss of information due to staff turnover; more focus on local management building a history of managing an area	Clear requirement to refer to previous documents, but with use of locally based systems that makes it easy to find out what has gone on before	Moderate to difficult – requires setting up of data retrieval system that is easy to use and not too cumbersome to maintain.
The Environment Agency is driving for more and more detail, with no decisions being made at an early stage, mainly due to risk aversion	Move to defining the appraisal process such that the level of detail is driven by uncertainty and risk, thus is proportionate to problem being assessed. Will require EA, approvers, etc. to accept that appraisals will all look slightly different and have different levels of detail	Change in emphasis from completing PAR to one of making the 'best' decision  Change in attitude of approvers, project managers  Consultation during development of new guidance can help educate on how things are going to change	Moderate to difficult – requires change in attitude from all (users and approvers), will need to draw on new guidance
The appraisal process is getting bigger, not more focused	Revision of approach to appraisal, following solutions set out above	Redefinition of how an appraisal is to be undertaken	Moderate – but will depend on other changes being made
Expectations of what will be provided are high (from project managers to approvers and stakeholders)	Expectations will have to change from what is included in a report to the quality of the decision being made and the approach used to reach that decision. This requires a change in attitude from filling in boxes to one of story telling	Education of approvers, etc. but should be more logical process  Consultation during development of guidance can help educate	Moderate – requires change in views of how things should be done and will depend on other changes being made

**Table 4.3 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
<p>Approvers do not understand the issues, leading to pressure for ever greater clarity – any weaknesses tend to result in a PAR being sent back for review, even if this does not affect overall decision-making</p>	<p>Need for training of both users and approvers so everyone is working from the same understanding of both the guidance and the appraisal process. Greater responsibility being given to those doing the appraisal in demonstrating the case being made. Greater flexibility in report content to allow this development of ideas</p>	<p>Training on project appraisal and guidance preferably with mixed groups of users, project managers and approvers – could be undertaken during development of guidance to help encourage buy-in</p>	<p>Moderate – requires arrangement of numerous opportunities for training and feedback</p>
<p>No guidance on who is making the decision and inconsistencies between CFMPs (which go to RFDCs) and PARs (which go to NRG)</p>	<p>Clarification on the pathways followed by each appraisal, not just who approves but how plans feed into each other, who does what and when and what their particular responsibilities are</p>	<p>Will need to be developed alongside revised guidance, but could be prepared based on current guidance (but this may identify problems that cannot be easily addressed)</p>	<p>Moderate to difficult – either will need to develop based on existing approaches or develop alongside new guidance</p>
<p>There is no appropriate guidance for small schemes</p>	<p>Change in approach to appraisal driven by uncertainty and risk should help reduce impacts. May need a <i>de minimus</i> approach below which appraisal is not required</p>	<p>Need for approach based on risk of making the ‘wrong’ decision. Should fall out of appraisal process driven by uncertainty</p>	<p>Moderate – will require involvement of those assessing small schemes (IDBs, LAs) during development of new guidance</p>
<p>No allowance for judgement as to when an appraisal should/should not be undertaken</p>	<p>Change in emphasis of appraisal process and guidance from completing a PAR to identifying the ‘best’ solution at an appropriate level of detail. This will rely heavily on the judgement and skill of the appraisers, but will still require reporting that summarises the key points of the appraisal to maintain transparency and auditability</p>	<p>Revised approach will require a lot of trust to be placed in appraisers, i.e. that they are applying sound judgement – may be problems if there are skills shortages, so will need to ensure there is a strong feedback system</p>	<p>Moderate to difficult – requires new approach to be in place and for appraisers to embrace the opportunity and invest into the new approach to help ensure it is successful</p>

**Table 4.3 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
Small schemes have to go through too many hoops, driving up the costs	Clarification of pathways and change in emphasis away from completing the PAR should help reduce the hurdles faced by those promoting small schemes	Will need to be developed alongside the revised guidance and link into pathways to ensure that the approach for small schemes is simplified	Moderate to difficult – requires consultation with those promoting small schemes, but also need to ensure that transparency and auditability are retained

### **4.3 Is the content consistent with other available guidance and similar to that available for other fields/internationally?**

#### **What is the problem?**

There are two factors associated with this question:

- is the current suite of FCERM guidance consistent with the Treasury Green Book?; and
- how does the current suite of FCERM guidance compare with other guidance?

The proforma used in Task A1 (review of guidance documents) was designed around the requirements of the Treasury Green Book (TGB). Therefore, a review of the completed proformas gives an indication of the extent to which the current FCERM guidance is consistent with Treasury Green Book requirements. Table 4.4 provides a summary of the comparison; it also includes a comparison of five other guidance documents. These have been selected from the long-list reviewed under Task A1 as being those that cover full economic analysis (i.e. estimation of both costs and benefits).

Table 4.4 shows that most of the Treasury Green Book requirements are covered in one or more of the guidance documents. However, there is no one document that can be used throughout the whole process, which can make it difficult to find guidance on a particular issue. Some elements of the appraisal process are covered in more than one guidance document. This can result in practitioners reading only part of the overall guidance or being confused by the duplication.

Comparing the FCERM guidance with the five other guidance documents shows that the FCERM guidance is relatively comprehensive. There are issues with all of the guidance documents in terms of optimisation during the appraisal, including refinement of approaches and data. However, Table 4.4 is based on a review of the main guidance documents only, where additional guidance may be followed prior to commencing the appraisal.

**Table 4.4 Comparison of requirements of Treasury Green Book (TGB) with FCERM and other guidance**

TGB	CFMP	SMP	FCDPAG series <sup>1</sup>	MCM and Handbook	WFD29	HSE (2001)	SRA (2003)	TAG	MCA
As options are developed, review the impacts of risks, uncertainties and inherent biases	Y	Partly	Y (2, 4, 5)	Y	Partly	N	N	N	N
As stages of assessment progress, data must be refined to become more specific and accurate	N	N	Partly (4)	Y	N	Y	Y	N	Y
Effort applied at each step should be proportionate to the funds involved, outcomes at stake and time available	N	N	Partly (2)	Y	Y	N	Y	N	Y
Identify if there is a clearly identified need	Y	Y	Y (1, 3, 4)	Partly	Y	Y	Y	Y	Y
Identify if any proposed intervention is likely to be worth the cost	N	Y	Partly (2, 3)	Partly	N	N	Y	Y	Y
Set out desired outcomes and objectives	Y	Y	Partly (3, 4)	N	Y	N	N	N	N
Identify a full range of options to deliver the objectives	Y	N	Y (1, 3, 4, 5)	Partly	Y	Y	Y	Y	Y
Set targets to help progress towards meeting objectives	Y	Y	N	N	Y	N	Y	N	N
Identify and value the costs of each option	N	Y	Y (2, 3)	N	Y	Y	Y	Y	Partly
Identify and value the benefits of each option	Y	Y	Y (2, 3) Partly (5)	Y	Y	Y	Y	Y	Y
Adjust the costs and benefits for distributional issues	Partly	N	Y (revision notes)	Partly	N	N	N	Y	Partly
Adjust the costs and benefits for relative price movements	N	Y	Y (2, 3)	Y	N	N	Y	Y	Partly

**Table 4.4 Comparison of requirements of Treasury Green Book (TGB) with FCERM and other guidance**

TGB	CFMP	SMP	FCDPAG series <sup>1</sup>	MCM and Handbook	WFD29	HSE (2001)	SRA (2003)	TAG	MCA
Adjust for the different timing of costs and benefits by discounting	N	Y	Y (2, 3)	Y	N	Partly	Y	Y	Y
Adjust for material differences in tax	N	N	N	Y	N	N	N	Y	Y
Adjust for risk and optimism	N	Y	Y (4, revision note)	Partly	N	N	N	Y	Partly
Consider the impacts of changes in key variables and different future scenarios on the base case	Partly	Partly	Partly (2, 3, 4)	Partly	N	Partly	Partly	Y	Y
Consider unvalued impacts	Y	Y	Y (2, 4, 5) Partly (1, 3)	Y	Partly	Partly	Y	Y	Y
Use of decision criteria and judgement to select the best option or options, which should then be refined into a solution	Partly	Y	Y (3, 4) Partly (5)	Y	N	N	Y	Y	Y
Undertake consultation at the decision-making stage	Y	Y	Y (1, 2) Partly (5)	Y	Y	Partly	N	Y	Y

Key: Y – guidance is given and is useful; N – no guidance given; partly – guidance is given on part of the issue or is not always helpful

Notes: <sup>1</sup> The number given relates to the volume of the FCDPAG series where the guidance can be found

References: WFD29: SNIFFER & Environment Agency 2004. Management strategies and mitigation measures required to deliver the Water Framework Directive for impoundments, Volume 1 – Preliminary guidance document, Project WFD29, December 2004.

HSE 2001. Reducing risks, protecting people, HSE's decision-making process, Suffolk: HSE Books.

Strategic Rail Authority 2003. A guide to the appraisal of support for passenger and freight rail services.

Department for Transport 2005. Transport Analysis Guidance (TAG), London: ITEA Department for Transport.

Defra 2003. Use of Multi-Criteria Analysis in Air Quality Policy, prepared by Philips & Stock, November 2003.

Many of the non-FCERM guidance documents appear to omit discussion on objectives. In some cases, this is because the objectives have been set elsewhere, for example, guidance documents prepared for the Water Framework Directive. Other guidance documents such as the UKCIP guidance (UKCIP 2003) on climate change emphasise the importance of understanding the objectives. The Institute of Public Health (2006) guidance states the need to set out objectives, but does not mention that these should be measurable. Only the Countryside Council for Wales *et al* (2004) guidance on Strategic Environmental Assessment identifies the need to set out objectives that follow the SMART (specific, measurable, achievable, relevant and time-bound) principle.

This is in comparison with the TGB which states that ‘if an intervention seems worthwhile, then the objectives of the proposed new policy, programme or project need to be stated clearly. The TGB also mentions the need to set targets using the SMART approach.

Table 4.5 summarises the problems related to the consistency of content when compared with other guidance documents. The significance of each problem is also indicated in terms of how it affects the approach being used and its influence on the outcome of the appraisal. The table draws in evidence from consultation and the review of Project Appraisal Reports and the existing set of FCERM guidance.

**Table 4.5 What is the problem?**

Problem	Significance in terms of ...	
	Approach used	Appraisal outcome
Some issues set out in the Treasury Green Book are not covered in FCERM guidance	High	Medium
Some issues set out in the Treasury Green Book are covered more than once in FCERM guidance	Medium	High

The next step is to identify the causes of the problem, in order to determine if the problem can be solved by changes to the guidance or requires other changes to be made.

**What are the causes of the problem?**

Respondents to the detailed questionnaire expressed general satisfaction with the content and format of the FCDPAG series, although no respondents indicated that any of the volumes always answered their questions. The proportion of respondents considering that each volume usually answered their questions was generally high:

- FCDPAG1: 73%;
- FCDPAG2: 83%;
- FCDPAG3: 71%;
- FCDPAG4: 60%; and
- FCDPAG5: 63%.

Most of the remaining respondents considered that the FCDPAG series provides pointers, but they have to find out more from elsewhere. This often involves talking to someone with experience of particular issues, or obtaining information from other sources (particularly for more technical aspects). Only one respondent indicated that any of the documents did not cover what they needed (FCDPAG5).

The number of users of the SMP and CFMP guidance was low (4 and 3 respondents, respectively). For both guidance documents, the majority of respondents (3 and 2, respectively) indicated that the guidance provides pointers, but they have to obtain information from elsewhere. Respondents also commented that the guidance needs to be changed to make it easier to find specific information.

Many of those using the Multi-Coloured Manual (MCM) and Handbook are looking for specific information, e.g. depth-damage data. Three-quarters of those using the MCM and/or Handbook noted that the guidance usually answered their questions although 50% of respondents had to search for the information, with 25% having to look elsewhere for more information. This is usually where the principles of the MCM needed to be adapted to situations beyond the scope of the guidance, e.g. losses due to rail/traffic disruption, flood warning reduction, disruption to hinterland. Most respondents (67%) found the presentation and organisation of the Handbook easier than the MCM, with reasons given such as:

- the Handbook text is available as a pdf so searches are easier to make;
- the Handbook has a better layout, clearer section numbering;
- chapters in the Handbook are well-defined with logical headings. Colour-coding for the chapter headings and pages is helpful. Extensive use of tables makes the information more accessible and easier to find; and
- the Handbook has a better structure and is nicer on the eye. It also provides only an overview which is sometimes all you need.

Table 4.6 sets out the cause of each problem identified in Table 4.5 as having an effect on the content being consistent with other available guidance. This draws on evidence from consultation, in particular the workshops and detailed questionnaire. The table provides an indication of the extent that each cause is driving the problem.

**Table 4.6 What are the causes of the problem?**

<b>Problem</b>	<b>Causing problem</b>	<b>Influence on problem</b>
Some issues set out in the Treasury Green Book are not covered in FCERM guidance	Users have to go elsewhere to find information that they need, potentially leading to inconsistencies	High
Some issues set out in the Treasury Green Book are covered more than once in FCERM guidance	Users find it difficult to find specific information or to know that they have read all of the relevant information (particularly for SMPs and CFMPs)	High

Table 4.6 shows that the main problems relate to user confidence in the guidance, i.e. where they can find the information that they need and knowing that the information given in one document is sufficient (and is not contradictory to information given elsewhere). This is as much of a problem in terms of updating the guidance. The Department for Transport provides most of its guidance online (through TAG – Transport Analysis Guidance). The TAG Units are given version numbers and dates. The on-line version can be updated, with new version numbers/dates to highlight where changes have been made. It is usual for text that has been changed to be indicated through use of vertical lines either side of the updated text. Explicit links are also made to the Treasury Green Book (TGB), for example, in TAG Unit 2.7. This unit explains how the requirements of the TGB have been incorporated into the appraisal process.

Other guidance documents are available in Adobe Acrobat (pdf) format and include bookmarks to each section and sub-section to allow for easy searching. This is the approach used by European Communities (2003) for the Technical Guidance Document and, indeed, the FCDPAG volumes that are available for download from the Defra Internet site. Even more useful is the use of links within a pdf document that allows a user to click on a section to move to it. This is the approach used by the Department for Transport (2001) guidance for ports.

The next step is to consider what solutions are required to tackle the causes of the problems.

### **What are the solutions?**

Table 4.7 sets out potential solutions for each cause and each problem. Some of the causes require more than one solution, or have alternative solutions. For each solution, action that can be taken is described with the ease of implementation also given (ranging from easy to difficult). Where possible, the solutions are linked to existing process or appraisals. Evidence of the solutions is drawn from consultation, and from the review of guidance documents and appraisal processes used in other fields. The review of PARs is also used where one (or more) PARs have included impacts that could not be easily valued, as these suggest that approaches are already available that could reduce or remove the problems.

Table 4.7 shows that there are possible solutions to all of the causes of the problems. Many of these solutions require other actions to be put into place such that the changes will take time.

Those areas not currently covered in the guidance are considered in more detail in Section 4.4, below. It is important when deciding to add further information on those areas not currently covered that any information provided is clear, concise and unambiguous. One of the key concerns raised through consultation for this project was that any changes to the guidance would result in an increase in length. It is likely to be important, therefore, to also consider the potential for consolidation of some text to reduce duplication. This would simplify use of the guidance and help make the documents more user friendly. This could be assisted by the use of online presentation (e.g. as with

Department for Transport (DfT 2005) Transport Analysis Guidance), where a user clicks on links to move between sections.

Provision of a consolidated index across all of the guidance documents would make it easier to identify where a particular issue is covered in more than one place. This would make it easier for a user to find and could help if the guidance is to be restructured and available in an on-line/searchable form. See Section 3.2 for further discussion on the development of a consolidated index and changes to the presentation and medium used.

The main area missing from the current FCERM guidance documents (not covered elsewhere in this report) is how to deal with distributional issues. Many of the other guidance documents discuss distributional issues but do not explain how to adjust for them. The DfT (2003) guidance includes an audit to identify which are the vulnerable groups in the local economy, while the DfT (nd) guidance on multi-modal transport appraisal investment gives a higher weighting to benefits to low income groups.

There is only limited information in terms of guidance used internationally for flood risk management. It is difficult to compare the FCERM guidance with that used in other countries as, in most cases, the guidance documents themselves are not available. The following discussion focuses on approaches used in Australia, the Netherlands and New Zealand.

Guidance in Australia is based on Flood Management Manuals, which are focused mainly on risk assessment but include an Appendix that covers the estimation of flood damages. The approach is based on the calculation of Average Annual Damages (AAD), with the guidance focused on a very detailed approach (for example, involving measuring all of the floor levels of all properties that may potentially be affected by a flood event). Much of the emphasis is on the approaches to be used to collect information on actual flood damages after a flood has occurred (NSW Government nd).

Approaches to risk management in Australia are linked to five options (BTRE 2002):

- accept risk (do-nothing);
- reduce the likelihood of occurrence (e.g. structural flood defences);
- reduce consequences (e.g. modifications to property);
- transfer risk in full or in part (e.g. insurance); and
- avoid risk (e.g. no building in flood prone locations).

The Australian guidance recognises the difficulty of capturing social, health and environmental benefits and costs. It also discusses the importance of equity issues, but states that these are 'more appropriately dealt with by public policy makers and elected representatives'. The guidance also notes that use of cost-benefit analysis could result in non-structural mitigation measures appearing unsuitable, and potentially disadvantage lower socio-economic groups if it is the only decision tool. As a result, the recommendation is that cost-benefit analysis is a powerful tool for examining the justification for taking action and prioritising, but it should not be the sole decision tool (BTRE 2002). Many of these issues

are similar to those raised during consultation, suggesting that there are no easy answers and that flexibility and experience is required to ensure that the 'best' decisions are made.

No economic appraisal guidance documents have been found for other countries, although there is information on approaches used. The general principles do not appear different from those in the FCERM guidance, but it is difficult to draw many conclusions due to the lack of detail on the actual approaches used.

In the Netherlands, it has been law since 2000 that all large infrastructure projects be assessed using cost-benefit analysis. This generally involves the application of a two-step process: firstly, a cost-benefit analysis based on technical solutions followed by a second step based on cost-effectiveness analysis where partial, but more sustainable solutions are tested to maintain a constant standard of protection. The Netherlands Ministry of Finance set a discount rate of 4% in 1995 for projects of national importance. Approaches are used to try and value as many impacts as possible (including environmental), but these are recognised as being imperfect. There is also consideration of distributional issues, which is to be taken into account in the interpretation of the cost-benefit analysis (Bruisma & Vreeker 2004). Work carried out looking at what is actually undertaken in cost-benefit analyses in the Netherlands has shown that it is often only the monetised impacts that are included (Jonkman *et al.* 2004). The Netherlands also uses a statutory standard of protection (from 1 in 10000 to 1 in 250), with a statutory periodic review procedure (EEA 2001).

A recommendation from 1999 in Finland sets the standard of protection to residential properties against return periods of 1 in 200 years, while agricultural land is protected to a standard of 1 in 20 (EEA 2001).

In New Zealand, there is concern that the much of the depth-damage data being used is from work undertaken in 1986. The method typically used to estimate the costs of any natural disaster is to categorise losses into tangible and intangible, and within these as direct and indirect. Loss of life is included as a tangible cost (NZIER 2004).

**Table 4.7 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
Users find it difficult to find specific information or to know that they have read all of the relevant information (particularly for SMPs and CFMPs)	Provision of consolidated index of guidance and/or on-line guidance with links	Consolidated index across all guidance documents  On-line guidance with links	Easy – see Section 3.2  Moderate to difficult – see Section 3.2

**Table 4.7 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
Users have to go elsewhere to find information that they need, potentially leading to inconsistencies	Need to ensure that all important information (e.g. rules) are included in the guidance and are clear and unambiguous. Potential to provide a help desk or similar facility to provide additional advice and/or FAQs area on Internet site	Provision of clear information on those areas not currently covered or which are open to interpretation  Provision of helpdesk or similar where appraisers can obtain information and advice to reduce the potential for inconsistencies	Moderate – requires updating of guidance in those areas where information is currently lacking (see Section 4.4)  Moderate – need replacement for Defra Regional Engineers within the Environment Agency

#### 4.4 Are any topics/issues missing or covered in too much detail?

##### What is the problem?

Table 4.8 summarises the problems related to topics and issues that are missing or covered in too much detail. The significance of each problem is also indicated in terms of how it affects the approach being used and its influence on the outcome of the appraisal. The table draws in evidence from consultation and the review of Project Appraisal Reports and the existing set of FCERM guidance. Many of the problems set out in Table 4.8 are covered in other sections of this report; to avoid duplication a reference is included to where the particular issue is addressed and it is not considered further here.

**Table 4.8 What is the problem?**

Problem	Significance in terms of ...	
	Approach used	Appraisal outcome
The guidance is not specific enough or clear enough in some areas meaning judgement is required (see Section 3)	High	High
The worked examples included are too obvious (see Section 3)	Medium	Medium
Guidance does not always nail down the issues, leaving a number of escape routes (see Section 3)	Medium	Medium
The guidance has not kept up with constantly changing Government policy (see Section 3)	High	High

**Table 4.8 What is the problem?**

Problem	Significance in terms of ...	
	Approach used	Appraisal outcome
No guidance on the level of detail that is appropriate and what should/should not be included (see Section 4.2)	High	High
There is no guidance on who is making the decision (see Section 4.2)	High	Medium
Guidance is inappropriate for smaller schemes (see Section 4.2)	High	Medium
The guidance does not indicate how/where policies feed down into strategies (see Section 4.2)	High	Medium
There is very little guidance on how to assess the do-nothing option (see Section 5)	High	High
The guidance makes it difficult to take some of the costs (e.g. legal costs, costs of making structures safe, etc.) into account in the do-nothing option (see Section 5)	High	High
Change in emphasis from flood defence to flood risk management has not been matched in the guidance (see Section 7)	Medium	Medium
No guidance on how far impacts should be monetised (see Section 8)	Medium	High
For social issues, both policy and guidance are lacking (see Section 8)	Medium	High
Uncertainty about whether the environmental and social issues in the guidance are the most relevant (see Section 8)	Low	High
No clear procedure on how to measure and weight the loss of community infrastructure and cohesion (see Section 8)	Medium	High
No guidance on how to include risk to life (see Section 8)	Medium	High
No real guidance on when/what to analyse when testing for uncertainty (see Section 9)	High	Medium
Guidance does not adequately address how difficult it is to predict what will happen over 100 years (see Section 9)	Medium	Medium
There is little guidance on dealing with climate change in the fluvial environment (see Section 10)	Medium	Medium
The guidance does not explain what to do if the adjustments for climate change affect the outcome (see Section 10)	Low	High
Scenarios are not covered in the guidance (see Section 10)	Medium	High

**Table 4.8 What is the problem?**

Problem	Significance in terms of ...	
	Approach used	Appraisal outcome
There is little guidance on how to deal with capping of damages caused by sea level rise (see Section 10)	Low	Low
There is guidance on environmental issues but it is not clear how to use it in decision-making (see Section 11)	Medium	High
Guidance does not encourage optimisation enough (see Section 11)	Medium	High
The current guidance tells you what to think about in terms of extreme events but not how it should be done (see Section 12)	Medium	Medium
There is no pre-feasibility guidance	High	High
Guidance does not reflect the current state of knowledge	Medium	Medium
Guidance is not based on sustainability criteria	Medium	Medium
There is no method for including knock-on benefits of providing flood risk management measures	Medium	Medium

Table 4.8 shows that there are four issues in terms of area of the guidance documents that may be lacking that are not specifically addressed elsewhere in this report. This Section focuses on providing specific solutions to these problems, but these are not totally independent of solutions identified in other Sections, hence, further links are made as appropriate.

The next step is to identify the causes of the problem, in order to determine if the problem can be solved by changes to the guidance or requires other changes to be made.

### What are the causes of the problem?

Table 4.9 sets out the cause of each problem identified in Table 4.8 as having an effect on whether any topics/issues are missing or covered in too much detail. This draws on evidence from consultation, in particular the workshops. The table provides an indication of the extent that each cause is driving the problem.

**Table 4.9 What are the causes of the problem?**

Problem	Causing problem	Influence on problem
There is no pre-feasibility guidance	Lack of guidance setting out what should be done in a pre-feasibility study	High

**Table 4.9 What are the causes of the problem?**

<b>Problem</b>	<b>Causing problem</b>	<b>Influence on problem</b>
Guidance does not reflect the current state of knowledge	Recent rapid changes in policy and continuous development of new approaches that are not reflected in the guidance documents but in supplementary notes	High
Guidance is not based on sustainability criteria	The guidance was developed before sustainability criteria were fully accepted	High
There is no method for including knock-on benefits of providing flood risk management measures	It is difficult to predict some of the benefits at the outset, because the potential outcomes are often unknown	Medium
	It is difficult to monetise these types of impacts (see Section 8)	High
	There is little project evaluation undertaken that would allow such benefits to be recognised as a benefit of the scheme	High

Table 4.9 shows that the problems are not always directly linked to the guidance but to outside influences (e.g. changing policy, changing approaches, lack of project evaluation). Such changes require updates or revisions to be made to guidance. In some cases this has happened (e.g. through supplementary notes). There are issues in terms of keeping up with the latest versions of the guidance, in particular the supplementary notes, with 66% of respondents to the detailed questionnaire highlighting this as a problem. Comments from responses to the detailed questionnaire include:

- although updates are issued to operating authorities, practitioners generally have to find out for themselves through the Defra website (Defra provides updates to those on the FRM database, which suggests that the database does not include all those involved with project appraisal); and
- effort is required to keep track of information on the Defra website.

Specific issues were raised with regard to the Environment Agency, such as ‘the Environment Agency does not manage supplementary guidance at all for its staff’ and ‘too much material to assimilate successfully’.

The next step is to consider what solutions are required to tackle the causes of the problems.

### **What are the solutions?**

Table 4.10 sets out potential solutions for each cause and each problem. Some of the causes require more than one solution, or have alternative solutions. For each solution, action that can be taken is described with the ease of implementation also given (ranging from easy to difficult). Where possible, the solutions are linked to existing process or appraisals. Evidence of the solutions

is drawn from consultation, and from the review of guidance documents and appraisal processes used in other fields. The review of PARs is also used where one (or more) PARs have included impacts that could not be easily valued, as these suggest that approaches are already available that could reduce or remove the problems.

Table 4.10 shows that there are possible solutions to all of the causes of the problems. Many of these solutions require other actions to be put into place such that the changes will take time.

Many of the solutions set out in Table 4.10 require the guidance to be revised and updated, taking into account recent changes and developments and presenting the new guidance in a readily accessible format. This may need to be accompanied by project evaluation to help determine what benefits arise (e.g. from providing a particular solution in a particular area), which could then feedback into appraisals to provide a more robust approach.

**Table 4.10 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
Lack of guidance setting out what should be done in a pre-feasibility study	Links to solutions given in Section 4, where there needs to be a move to an appraisal based on risk and uncertainty, where the level of detail required is linked to the decision being made and issues being assessed	Need to refocus the appraisal process and guidance	Easy to difficult – see Section 4, needs change such that those doing the appraisal argue the critical aspects of choice
Recent rapid changes in policy and continuous development of new approaches that are not reflected in the guidance documents but in supplementary notes	Need for consolidation of current guidance into easy to access, one-stop shop (e.g. on-line) Need for programmed reviews of guidance Need for better dissemination, cascading of changes	Need to review all of guidance to take recent changes into account and fully update the approach (see Section 3 for ways of presenting information)	Moderate – requires complete review of guidance and presentation in new, easier to access ways, but is in line with approaches used by DfT, for example
The guidance was developed before sustainability criteria were fully accepted	Need for review of guidance taking into account the need to consider non-structural solutions and to include social and environmental issues (see Sections 8 and 11)	Need to review all of the guidance and incorporate solutions given in Sections 8 and 11	Moderate to difficult – requires a lot of changes, not just to guidance, but to approaches

**Table 4.10 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
It is difficult to predict some of the benefits at the outset, because the potential outcomes are often unknown	Need to move towards scoping benefits more widely at the outset (see Section 8). However, knock-on benefits will always be difficult to predict and it may be necessary to describe the potential for such benefits for consideration when selecting the preferred solution	Need to revise approach to decision-making such that it is easier to take non-monetised benefits into account (see Section 9)	Moderate to difficult – requires change to approach but also to attitudes (e.g. of approvers)
It is difficult to monetise these types of impacts (see Section 8)	See above – they may not be monetisable so may only be possible to describe them and use them to aid optimisation when selecting the best solution (see Section 9)	Need to revise approach to decision-making such that it is easier to take non-monetised benefits into account (see Section 9)	Moderate to difficult – requires change to approach but also to attitudes (e.g. of approvers)
There is little project evaluation undertaken that would allow such benefits to be recognised as a benefit of the scheme	Need for project evaluations to be undertaken to determine whether particular types of solution provide more/less benefits than others and to assess what benefits could arise	Need for project evaluation – should be undertaken now but is only very rarely done	Difficult – requires time/resources that could be spent providing risk management solutions, but could help improve appraisals

## 4.5 Are adequate tools available for practitioners to undertake appraisals effectively?

### What is the problem?

Section 4.4 of this report concentrates on areas of the guidance that may need to be expanded or added to. This Section focuses on the approaches used and tools that are available.

Table 4.11 summarises the problems related to the availability and usefulness of the existing tools. The significance of each problem is also indicated in terms of how it affects the approach being used and its influence on the outcome of the appraisal. The table draws in evidence from consultation and the review of Project Appraisal Reports and the existing set of FCERM guidance, as well as consultation. As with Table 4.8, above, this table includes a lot of issue that are addressed elsewhere in this report; to avoid duplication, a reference is given to

the Section of the report in which they are addressed. Table 4.11 also does not repeat any of the issues included in Table 4.8.

**Table 4.11 What is the problem?**

Problem	Significance in terms of ...	
	Approach used	Appraisal outcome
New version of the guidance often arrive in the middle of a project (see Section 3)	High	Medium
There tends to be a never-ending process to appraisal, always adding on information (see Section 3)	Medium	Low
The strategy/CFMP/PAR, etc. guidance is inconsistent (see Section 4.2)	Medium	Medium
The guidance has not kept up with the move away from capital/structural schemes (see Section 7)	Low	Medium
There is no tailored guidance on how to take account of environmental and social issues (see Section 8)	High	High
The results of the Environmental Impact Assessment are difficult to integrate into the appraisal process (see Section 8)	Medium	High
It is difficult to measure and weight the loss of community infrastructure and cohesion (see Section 8)	Medium	High
Use of spreadsheets is leading to sensitivity being lost (see Section 9)	Low	Medium
Guidance on how to deal with climate change is missing or inconsistent (see Section 10)	High	High
Building in climate change now might be economical for one scheme, but doing so may take money away from a second scheme (see Section 10)	Low	Medium
The guidance does not encourage optimisation as the current PAG series is focused on identifying and comparing options rather than providing a process that leads to the 'correct' solution (see Section 11)	High	High
The current guidance contains some rules and some guidance	Medium	Medium
There is a huge amount of replicated/repeated study	High	Low
Big issues like community relocation are prevented from being included in an appraisal	Medium	High
It is difficult to know when to engage a particular expert making it difficult to draw on expertise from other fields to make an appraisal more comprehensive	Medium	High
There is too much emphasis on recreational benefits	Medium	Medium

**Table 4.11 What is the problem?**

Problem	Significance in terms of ...	
	Approach used	Appraisal outcome
There is limited influence of environmental and social issues on the priority score	High	Medium
There are currently lots of different approaches to taking account of equity, such that people use the approach that is most likely to push their scheme ahead	Medium	High
Practitioners latch onto bits of policy before clear Defra/EA policy is formed	Medium	Medium

Table 4.11 shows that there are eight issues not covered in other sections that can be linked to the apparent inadequacy of existing tools, although in many cases this is linked to approaches set out in the guidance and appraisal process rather than more specific tools (e.g. the FCDPAG3 spreadsheets).

Indeed, none of the respondents to the detailed questionnaire stated that the FCDPAG3 spreadsheets were not useful. Around three-quarters of users of the MCM and MCH stated that it usually answered their question, while 25% often had to look elsewhere. This occurred where the problem was outside the scope of the MCM and MCH.

The next step is to identify the causes of the problem, in order to determine if the problem can be solved by changes to the guidance or requires other changes to be made.

### **What are the causes of the problem?**

Table 4.12 sets out the cause of each problem identified in Table 4.11 as having an effect on whether adequate tools are available. This draws on evidence from consultation, in particular the workshops. The table provides an indication of the extent that each cause is driving the problem.

**Table 4.12 What are the causes of the problem?**

Problem	Causing problem	Influence on problem
The current guidance contains some rules and some guidance	There is confusion as to what are rules and what is process	High
There is a huge amount of replicated/repeated work	There is a lack of guidance as to what should be done at each level (and what should not be done). This issue is addressed in Section 4.2	See Section 4.2
Big issues like community relocation are prevented from being included in an appraisal	There is a gap in available approaches and type of options that can be included	High

**Table 4.12 What are the causes of the problem?**

<b>Problem</b>	<b>Causing problem</b>	<b>Influence on problem</b>
It is difficult to know when to engage a particular expert making it difficult to draw on expertise from other fields to make an appraisal more comprehensive	Difficulty in making first links with new consultees	High
	Expensive and time-consuming to engage additional expertise	Medium
	Skills shortage	Medium
	Lack of buy-in from experts in other areas – they have competing demands for their time and flood risk management is not always a priority (e.g. planning)	High
There is too much emphasis on recreational benefits	Lack of early focus on the likely significance of different types of impacts and benefits	High
There is limited influence of environmental and social issues on the priority score	Approach to priority score is biased in favour of economics – this discourages people from spending time looking into environmental and social benefits	High
There are currently lots of different approaches to taking account of equity, such that people use the approach that is most likely to push their scheme ahead	Lack of a consistent, accepted and easy-to-apply approach to take account of equity issues	High
Practitioners latch onto bits of policy before clear Defra/EA policy is formed	Hearsay on what approvers require to approve projects	High
	Lack of clear dissemination path for updates to guidance	Medium

Table 4.12 shows that there is a wide range of different problems and causes of the problems. Many of the causes are wider than just guidance (e.g. skill shortage, difficulty of engaging other experts, and hearsay on what approvers require). Hence, there may be difficulties of addressing the causes through guidance alone.

The next step is to consider what solutions are required to tackle the causes of the problems.

### **What are the solutions?**

Table 4.13 sets out potential solutions for each cause and each problem. Some of the causes require more than one solution, or have alternative solutions. For each solution, action that can be taken is described with the ease of implementation also given (ranging from easy to difficult). Where possible, the solutions are linked to existing process or appraisals. Evidence of the solutions is drawn from consultation, and from the review of guidance documents and appraisal processes used in other fields. The review of PARs is also used where one (or more) PARs have included impacts that could not be easily

valued, as these suggest that approaches are already available that could reduce or remove the problems.

Table 4.13 shows that there are possible solutions to all of the causes of the problems. Many of these solutions require other actions to be put into place such that the changes will take time. Some of the solutions are also outside what can be amended through guidance and will require other actions to be taken by Defra and/or the Environment Agency if they are to be implemented. There is also likely to be a need for a change in approaches and attitudes, not just those undertaking the appraisals, but also those who approve them. This will be assisted by providing new approaches that are tailored by the appraiser to meet the specific requirements of the project, as this will not only help identify the appropriate level of detail but should encourage greater transparency.

**Table 4.13 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
There is confusion as to what are rules and what is process	Need for separation of rules and guidance/process, but will need to include changes proposed elsewhere if the new guidance is to address many of the current problems identified in this study	Separate guidance: rules and process. This has been proposed by Defra/Environment Agency	Easy to moderate – steps are already underway to provide this
There is a gap in available approaches and type of options that can be included	Research is needed into how issues such as community relocation may be addressed. This is already being undertaken to some extent (e.g. Project SD2: Developing a broader portfolio of options to deliver flooding and coastal solutions)	Need to identify other possible solutions and investigate if they are workable	Moderate to difficult – likely to face public opposition to some options
Difficulty in making first links with new consultees	Need to identify early on in the appraisal process where additional expertise is required such that there is time to identify the most appropriate organisations and individuals	Need for early scoping of issues to identify what the significant areas of the study will be	Moderate - use of ASTs should help to scope issues early on
Expensive and time-consuming to engage additional expertise	Need to focus the use of experts onto key issues and the most significant benefits/damages	Linked to early scoping of issues, in terms of what will be affected and likely significance	Moderate – again ASTs may help but will require careful programming of project

**Table 4.13 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
Skills shortage	Guidance needs to provide assistance to those who have less experience and/or use of help-desk, database of 'good' appraisals, etc.	Need to provide easy to access assistance that can be used to identify what needs to be done, if other experts need to be identified, etc.	Moderate to difficult – will never be able to address all problems, but dealing with simpler/commoner ones through guidance should help free up expertise for the more difficult / complex projects
Lack of buy-in from experts in other areas – they have competing demands for their time and flood risk management is not always a priority (e.g. planning)	Need to encourage involvement of other areas by making them aware of the problem and potential benefits of solutions. Also, there is a need to encourage other areas (particularly planning) to own the problem to allow more joined-up options to be included (e.g. SUDS)	Difficult to solve via guidance alone. Will require efforts of Defra/ Environment Agency to encourage working together. The requirements of the Water Framework Directive may provide a useful way of approaching this	Difficult – cannot be solved through guidance, needs change in working practices, but may be assisted by changes elsewhere (e.g. Water Framework Directive). Use of Sugden approach to encourage contributions may also help improve cooperation
Lack of early focus on the likely significance of different types of impacts and benefits	Need to encourage consideration of the significance of impacts and issues to determine the level of detail to which the appraisal should go (see also Section 4.2)	Use of ASTs to scope issues, with qualitative description of likely impacts, followed by quantification of significant issues and monetisation if required	Moderate – requires tiered approach to appraisal, with appraiser determining need to go to more detail
Approach to priority score is biased in favour of economics – this discourages people from spending time looking into environmental and social benefits	Need revision to priority score – this was the one area that everyone was agreed on in consultation – the current approach to the priority score is considered unfair, unequitable and discouraging consideration of the most sustainable solutions	Need for revision to approach to prioritisation so it is equally based on social, environmental and economic issues	Moderate – need approach to prioritisation that encourages the appraisal process to identify the 'best' solution, not to maximise the priority score
Lack of a consistent, accepted and easy-to-apply approach to take account of equity issues	Need for an agreed approach that everybody uses that is flexible enough to apply to most situations as required	Need approach that is easy to use and is 'fair'	Difficult – Sugden approach may help identify who benefits/loses

**Table 4.13 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
Hearsay on what approvers require to approve projects	Need for programmed approach to revising guidance that everyone is aware of and approach to appraisal that is driven by needs or project not by approvers	Change of focus of guidance and appraisal so is driven by needs of project and to move towards the 'best' solution	Difficult – requires a lot of changes to be made, and attitudes to change as well
Lack of clear dissemination path for updates to guidance	Linked to programmed review process (as above) and presentation in easy to access and easy to update format (e.g. online)	Linked to changes to presentation set out in Section 3 – online, easy to update, access and search	Moderate – requires complete review of guidance and presentation in new way

## 4.6 What are the barriers to applying the existing appraisal guidance to all other aspects of flood management activities?

### What is the problem?

This Section focuses particularly on the application of existing appraisal guidance to maintenance programmes, as it was these issues that were raised through the questionnaires and workshops.

Table 4.14, summarises the problems related to applying the existing appraisal guidance to all other aspects of flood management activities, particularly maintenance schemes. The significance of each problem is also indicated in terms of how it affects the approach being used and its influence on the outcome of the appraisal. The table draws in evidence from consultation and the review of Project Appraisal Reports and the existing set of FCERM guidance.

**Table 4.14 What is the problem?**

Problem	Significance in terms of ...	
	Approach used	Appraisal outcome
Inconsistent approach to appraising maintenance works compared to capital works	High	High
There are few links with integrated urban drainage, sewer flooding and wash-off	High	Medium
Predicting maintenance costs over 100 years is difficult	Medium	High
There is no consideration of the time to respond to emergencies or whether we can do anything about flooding, etc.	Medium	Medium
The do-nothing option is a particular problem for maintenance schemes	High	High

The next step is to identify the causes of the problem, in order to determine if the problem can be solved by changes to the guidance or requires other changes to be made.

### What are the causes of the problem?

None of the respondents answering the question about maintenance projects in the detailed questionnaire believed that the current guidance deals adequately with this issue. Respondents argued that the current guidance does not deal with maintenance problems but that these are likely to become an important issue under the Water Framework Directive. There were also concerns that the focus is on capital schemes rather than maintenance.

The main barriers were highlighted as:

- total lack of confidence in maintenance costs;
- benefits of maintenance not being fully assessed;
- the inability to predict future maintenance costs (particularly beyond ten years); and
- the difficulty and expense of maintaining some solutions (e.g. SUDS, where maintenance issues have not been resolved).

Table 4.15 sets out the cause of each problem identified in Table 4.14 as having an effect on whether there are barriers to applying existing appraisal guidance to other aspects of flood management activities. This draws on evidence from consultation, in particular the workshops. The table provides an indication of the extent that each cause is driving the problem.

**Table 4.15 What are the causes of the problem?**

<b>Problem</b>	<b>Causing problem</b>	<b>Influence on problem</b>
Inconsistent approach to appraising maintenance works compared to capital works	The present approach to appraisal is through the use of FDMM. This has four options for appraisal but gives no guidance as to which one to use. The methodology is also not wholly consistent with the appraisal guidance for capital works (FCDPAG and PAR)	High
There are few links with integrated urban drainage, sewer flooding and wash-off	Difficulty in determining maintenance requirements and who should be responsible/pay	High
Predicting maintenance costs over 100 years is difficult	Difficult to predict maintenance costs accurately beyond ten years due to uncertainties in terms of defence response, change in conditions, etc.	High
There is no consideration of the time to respond to emergencies or whether we can do anything about flooding, etc.	Lack of risk-based approach focusing on response times, etc.	Medium

**Table 4.15 What are the causes of the problem?**

<b>Problem</b>	<b>Causing problem</b>	<b>Influence on problem</b>
The do-nothing option is a particular problem for maintenance schemes	Difficulty in predicting the impacts of stopping maintenance, which may often be understated	High

Table 4.15 shows that the main causes of the problems are wide-ranging but are linked mainly to uncertainties and the difficulties of making predictions as to what will happen due to the number of factors involved.

The next step is to consider what solutions are required to tackle the causes of the problems.

### **What are the solutions?**

Table 4.16 sets out potential solutions for each cause of the problem. For each solution, action that can be taken is described with the ease of implementation also given (ranging from easy to difficult). Where possible, the solutions are linked to existing process or appraisals. Evidence of the solutions is drawn from consultation, and from the review of guidance documents and appraisal processes used in other fields. The table shows that there are possible solutions to all of the causes of the problems. Many of these solutions require other actions to be put into place such that the changes will take time.

**Table 4.16 What are the solutions and how can they be implemented?**

<b>Causing problem</b>	<b>Solutions</b>	<b>Ease of implementation of solution</b>	
Inconsistent approaches between maintenance and capital projects	Move towards an asset management approach with no differentiation between capital and maintenance investment methods	Present appraisals for capital works include options for maintenance. Therefore it should be a relatively small step to include in new guidance	Moderate to easy – but will need a change of attitude at area level and possibly additional training and skills
Difficulty in determining maintenance requirements and who should be responsible/pay	Need for combined appraisal, involving all potential players (local authority, water company, etc.)	Cannot be solved by guidance, needs cooperation between relevant authorities in a particular situation	Difficult – need for organisations to work together – may be assisted by Water Framework Directive

**Table 4.16 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
Difficult to predict maintenance costs accurately beyond ten years due to uncertainties in terms of defence response, change in conditions, etc.	Greater use could be made of standard values and maintenance costs data base. Improved information on asset condition and depreciation over time is also be needed	Time needed to set up cost database and means of updating and maintaining access	Moderate to easy – could be linked to capital costs database
Lack of risk-based approach focusing on response times, etc.	Need to use decision trees (or similar) to investigate the potential effects of different issues and to help determine where expenditure may be best spent	Use of decision trees, probabilities and consequences	Moderate – approaches are available, but would need to be tailored
Difficulty in predicting the impacts of stopping maintenance, which may often be understated	There must be a wealth of local information across the areas in the Environment Agency which could be tapped to assist in identifying impacts of stopping maintenance	Ensure full use is made of experience at all levels at area and bring together in a lessons learnt/guidance. This would also be of assistance for capital appraisals	Difficult to Moderate – many of the more experienced people have left or are leaving and have not passed on information or knowledge. Methods required to capture information that is not costly or time consuming

#### **4.7 What degree of consistency should be expected for appraisals at different scales?**

The workshops and detailed questionnaire identified that there are a lot of issues related to the level of detail required at different scales (SMP/CFMP, strategy, scheme). Concerns have been raised that there is a lot of duplication and repeated work. CFMPs, for example, are currently in a learning process about where they should start and stop. However, the variety in the size and scope of CFMPs is very large such that some are very broad brush while others go into a lot of detail. This raises the issue that any one level cannot provide a consistent level of detail because of differences between areas. Thus, consistency in the level of detail should not be expected.

Consultees also highlighted issues in terms of the current expectations that projects completed (SMPs, strategies) should feed down into studies. However, this is not always the case. Some SMPs have been written without apparent reference to strategies that are already in place. This raises a problem in terms

of the hierarchy of the various documents, which does not always link to the guidance as this developed over time. Thus, there is a problem that there is not a consistency of solutions running through the hierarchy of documents. In the PARs, this did not seem to be such a large problem as was suggested in the workshops, since 44 of the 67 PARs reviewed included reference to other strategies, schemes or high level plans (SMP, CFMPs, CHaMPs). Beadnell PAR, for example, includes links to the SMP and then develops it further at the strategy level. This highlights that there should be consistency in terms of the recommended solutions through the different levels and that this may be a larger issue in terms of perception than in reality.

Section 4.3 considers the extent to which the guidance documents are consistent with the requirements of the Treasury Green Book (TGB). The conclusions are that the FCERM guidance is consistent, possibly more so than guidance used in other fields. The review of PARs shows that most of the PARs follow the rules set out closely: the do-minimum option is considered in 56 out of 67 PARs, 43 out of 67 PARs used the 3.5% (reducing) discount rate (4 PARs predated the change to this discount rate), and 34 PARs use a 100 year time horizon (other time horizons were used to reflect the life of the longest-lived asset). Therefore, there already is considerable consistency with TGB rules and guidance.

The final element is in terms of the approaches used and consistency here. While there are differences in the approaches used in the PARs, not just between levels but also between PARs, the general principles are mostly the same. However, the main issues are not with the general approach used but when looking in detail about what has/has not been included. This is discussed in more detail elsewhere in this report, for example, in terms of approaches to estimating benefits (Section 8) or undertaking sensitivity analysis (Section 9). The general conclusions in these sections are that the approaches used have to change, as does the supporting guidance. Most of the changes proposed relate to providing an appraisal process that is driven by the issues and impacts that are relevant to a particular project. This suggests that there should not be a drive for appraisals that all include exactly the same information but, rather, that they should start from the same point. From here, there would be divergence between different projects, with some providing only very broad brush appraisals (e.g. where the 'best' solution is obvious) and others undertaking much more detailed analysis. The aim would be to move to a consistent goal – that of identifying the best possible solution. The steps in the appraisal process would be consistent, the rules to be used in decision-making would be consistent and the approach to reporting the appraisal could be consistent.

## **4.8 Overall solutions**

The Section includes questions related to the detail provided by guidance and the consistency in approaches and outcomes from the appraisals themselves. There are issues in terms of both aspects, and further in terms of what an appraisal has to provide. While there are a number of small steps that could be taken to reduce some of the issues, it is likely that the guidance needs to be significantly restructured. The small steps could include, for example,

developing definitions of what each plan, strategy, etc. is for or implementing an approach to project evaluation. These would address some of the issues but are unlikely to tackle the wider issues (e.g. attitudes, lack of skills), which guidance may not be able to solve on its own but a complete revision of the guidance could help move towards a new way of thinking about appraisals. This complete review of how appraisal is undertaken will require a change in emphasis to using appraisal to identify the 'best' (i.e. most sustainable) solution. This would allow the decision-making process to drive the level of detail required, based on the issues that are relevant to the project being appraised. Guidance to meet the change in emphasis would need to be developed in association with those who will apply it and those who will review/approve the appraisals. This allows comments and feedback to be obtained early on, and encourages buy-in to the whole process. Thus, attitudes could be at least partly changed by involving potential users of the new guidance in its developments, and by showing how their concerns have been addressed.

In terms of areas not currently adequately covered by the guidance, it is important when deciding to add further information that any additional information provided is clear, concise and unambiguous, and avoids an increase in length of the documents. Consideration will have to be given, therefore, to the potential for consolidation of text to reduce duplication. This would simplify use of the guidance and help make use of the documents more user friendly. This could be assisted by the use of online presentation of the guidance, with links between different areas to make it easier for users to find specific information. This may need to be accompanied by project evaluation to help determine what benefits arise (e.g. from providing a particular solution in a particular area), which could then feedback into appraisals to provide a more robust approach.

There is a need to move towards asset management to bring maintenance and capital appraisal together. There is no need for separate approaches as the focus should be on the most appropriate way to manage the asset, and the 'pocket' the funds come from should not have any bearing on the method of appraisal. This may also have knock-on benefits by changing the way that maintenance (and the maintain option) is perceived, from the 'worst' of the do-something options to, potentially, a viable and acceptable approach to reducing/managing flood risk.

There is also likely to be a need for a change in approaches and attitudes, not just those undertaking the appraisals, but also those who approve them. This will be assisted by providing new approaches that are tailored by the appraiser to meet the specific requirements of the project, as this will not only help identify the appropriate level of detail but should encourage greater transparency. It will be essential that practitioners are willing to justify why they have used a particular approach and this requires approvers to have confidence in the appraisers (and vice versa). Guidance cannot provide this alone, but it can encourage practitioners to draw on their experience and expertise.



## 5. The baseline

### 5.1 What does the current guidance say?

Section 8 in FCDPAG1 gives some pitfalls and common mistakes and notes the importance of the do-nothing baseline with Examples 6 and 7:

#### *Example 6*

*Making the assumption that something has to be done even when it is not justified. This can typically arise from political pressure after an event. If a full range of options is considered, and most importantly a ‘do-nothing’ option, this situation should not occur. A well considered ‘do-nothing’ option could temper political pressure when it is viewed in the light of making the best use of public funds.*

#### *Example 7*

*Failure to grasp the role of properly considering ‘do-nothing’ as the baseline against which other options are considered. The cause of this can be a misunderstanding of the principal assumptions of the ‘do-nothing’ case or a belief that it is simply not an acceptable option and therefore does not justify detailed consideration.’*

FCDPAG1 also stresses the importance of the do-nothing option in assessing sustainability.

The do-nothing option as the base line is described in FCDPAG2 (S3.2.5): ‘A realistic do-nothing scenario should be developed however inconceivable it may seem. The do-nothing option should always be considered as a potential solution, although the way it is presented to a wider audience will often need to be carefully considered. The do-nothing scenario will then form the baseline against which all other scenarios, including continuation of present practice (often the do-minimum option), should be tested in terms of economic, technical and environmental performance.

FCDPAG3 identifies the importance of properly considering the ‘do-nothing’ option (S3.1) and states that: ‘do-nothing is always an option’. It comments that: ‘Identifying the ‘do nothing’ option correctly is therefore critical to the analysis and needs careful consideration’ and also gives a guide to the (rare) cases where the do-minimum could be the baseline. The guidance is clear as to what the do-nothing option is and what should be included and why.

Both FCDPAGs 4 and 5 have no reference to a baseline.

Managing flood risk at the current level is identified in CFMP guidance as the baseline for the appraisal process. SMP1 makes no mention of baselines and SMP2 has policy baselines as ‘No active intervention’ (NAI) and ‘present management’.

MCM notes (S1.3.3) that: ‘there should be proper consideration of the do-nothing option – assumption that something must be done is to be avoided as it

can lead to the introduction of non-sustainable regimes of flood risk management and coastal erosion work'. The MCH only refers to do-nothing in the section on How to Compare Options where it states (Ch2) that: ‘..the appraisal process assesses option performance, usually by comparing the consequences of **‘do something’** options against some base-line option (usually **‘do nothing’**)’.

Project Appraisal Report Guidance highlights (in bold type and underlined) that: **‘The do nothing option must always appear as the baseline reference case (NB this really means DO NOTHING, see PAG 3 s3.1)’**.

## 5.2 What effort is appropriate for ‘do nothing’ assessment?

### What is the problem?

Most of the PARs (44 out of 67) reviewed under Task B1 did set out a clear do-nothing baseline, although the level of quantitative information varies widely. Seventeen of the PARs provided little or no quantitative information, while some PARs begin by immediately stating that do-nothing is not an appropriate option.

A good example of the description of the do-nothing option is given in the Flexbury PAR. This assumes that maintenance of the culverts would cease, resulting in culverts becoming blocked with debris. The probability that a blockage would occur is given with the impacts on surrounding properties described. The description of the impacts seems realistic and is described in non-emotive terms.

All of the issues from the workshops on the do-nothing baseline have the potential for significant impacts on the approach that is being used and the outcomes. A lot of time and effort is required if the do-nothing baseline is to be appropriate, but both the PARs and the workshops show that there is the perception that do-nothing is not an appropriate option.

Table 5.1 summarises the problems related to the appropriate level of effort required for assessment of do-nothing. The significance of each problem is also indicated in terms of how it affects the approach being used and its influence on the outcome of the appraisal. The table draws in evidence from consultation and the review of Project Appraisal Reports and the existing set of FCERM guidance.

**Table 5.1 What is the problem?**

Problem	Significance in terms of ...	
	Approach used	Appraisal outcome
The do-nothing option is highly uncertain	High	High
The do-nothing option is unrealistic, especially for urban areas	High	High
The do-nothing damages are often completely false	High	High

The next step is to identify the causes of the problem, in order to determine if the problem can be solved by changes to the guidance or requires other changes to be made.

### What are the causes of the problem?

Respondents to the detailed questionnaire commented that:

- definition of the do-nothing scenario is difficult and prone to wide variation;
- the do-nothing option is usually unreal and provides a very bad way of prioritising between schemes;
- do-nothing should be considered in the appraisal (as it may be the best thing to do) but must not be used to prioritise schemes; and
- the do-nothing option is a difficult concept and there is little guidance on what it means.

The lack of guidance on uncertainty and do-nothing was rated as being very important by 36% of respondents and a key issue by 45% of respondents.

Table 5.2 sets out the cause of each problem identified in Table 5.1 as having an effect on identifying the appropriate effort for the ‘do-nothing’ assessment. This draws on evidence from consultation, in particular the workshops. The table provides an indication of the extent that each cause is driving the problem.

**Table 5.2 What are the causes of the problem?**

<b>Problem</b>	<b>Causing problem</b>	<b>Influence on problem</b>
The do-nothing option is highly uncertain	The limits of the do-nothing option are not explained in the guidance	High
	Approach to assessing the do-nothing option is highly subjective	High
	A lot of time and money is spent on the do-nothing option	High
The do-nothing option is unrealistic, especially for urban areas	Social consequences of do-nothing are not taken into account	High
	The guidance makes it difficult to take some of the costs (e.g. legal costs, costs of making structures safe, etc.) into account	High
The do-nothing damages are often completely false	There is very little guidance on the do-nothing option	High
	One person will decide on one set of events; a different person or different office would use a completely different set of events	High

Table 5.2 shows that the main problems are related to the lack of guidance on how to assess the do-nothing option, what should be included and the extent to which impacts should be predicted. This includes not only the damages under

do-nothing but also the costs that may be incurred but which cannot be taken into account (other than as dis-benefits).

The next step is to consider what solutions are required to tackle the causes of the problems.

### **What are the solutions?**

Table 5.3, at the end of this section, sets out potential solutions for each cause and each problem. Some of the causes require more than one solution, or have alternative solutions. For each solution, action that can be taken is described with the ease of implementation also given (ranging from easy to difficult). Where possible, the solutions are linked to existing process or appraisals. Evidence of the solutions is drawn from consultation, and from the review of guidance documents and appraisal processes used in other fields. The review of PARs is also used where one (or more) PARs have included impacts related to this issue, as these suggest that approaches are already available that could reduce or remove the problems.

Table 5.3 shows that there are possible solutions to all of the causes of the problems. Many of these solutions require other actions to be put into place such that the changes will take time.

The solutions can be undertaken at two levels: either using a relatively easy to implement approach clarifying how the do-nothing baseline is to be used; or a complete change in the role of the do-nothing baseline. The easiest solution would be to clarify the role of do-nothing as the baseline against which the do-something options are to be assessed. However, it is not an option as it could not be implemented at no cost. Therefore, if there is not a case for constructing new defences or maintaining existing ones, there would be a further iteration when alternative options would be considered. This would have to link in with other projects such as the adaptation toolkit (Defra Project SD2: Developing a broader portfolio of options to deliver flooding and coastal solutions). This would be done by issuing a supplementary guidance note that proposes the use of Appraisal Summary Tables (ASTs) to ensure that all of the impacts (economic, environmental and social) under do-nothing can be included. The supplementary note would include details of the types of impacts that would be recorded in the AST, with examples where possible.

The second approach would require a more fundamental restructuring of the guidance, resulting in the do-nothing baseline being separated completely from a walkaway option. The walkaway option would include all of the costs and actions required to avoid future spend on the defences. This would need to include all of the legal costs, consultation and communications costs, costs of making any structures safe, etc. Areas where there is currently no economic justification for schemes, e.g. Happisburgh, could be used to provide an indication of the potential costs. There would be two advantages associated with not assessing this option unless there is no justification for doing something. Firstly, the assessment of the costs of the walkaway option is likely to be difficult and, in itself, time consuming. Secondly, it avoids encouraging people to increase the costs of walkaway to above another option (e.g. do-

minimum) that they are likely to prefer by separating the two strands of the appraisal. Clearly, though, consideration would have to be given as to whether the walkaway option is going to cost more than the do-minimum option at an early stage.

Thus, the appraisal process itself would not change significantly other than in terms of emphasising the role of do-nothing as the baseline only. Assessment of the do-nothing baseline would then require inclusion of all impacts (economic, environmental and social) with an AST again likely to be the best way of achieving this in a consistent and manageable manner. The revised guidance would focus on the categories included in the AST to ensure a comprehensive baseline is developed. This will need to draw on the experience of the project team, in consultation with local stakeholders. Communications with stakeholders will be key to ensuring that they understand the role of the do-nothing baseline and to help reduce the potential for exaggeration of impacts during data collection.

Also important will be setting out an order in which the appraisal should be undertaken. Thus, the do-nothing baseline should be one of (if not the first) action to be undertaken, with results reported before any work is done on the options (particularly the costs and benefits of the options). This should help reduce the potential for manipulation of the do-nothing baseline to help justify a scheme. It will be essential that sensible and realistic timescales are given to consultants/appraisers to allow them to undertake the appraisal in the most appropriate order. This does not mean that the do-nothing baseline would have to be assessed in minute detail from the outset, as it could be reviewed at a later date to add in extra detail providing the impacts themselves were not magnified once the level of costs and benefits is known.

The final step will be in making sure that the approach to decision-making is reviewed such that the qualitative benefits recorded in the AST can be fully taken into account. This will require revision of the decision-rule, perhaps to something similar to that in the MCA guidance where the difference in benefits (BCR or IBCR) can be compared with the difference between any (non-quantified) benefits of the options. Approvers will need to be flexible and be willing to accept that the selection of the preferred option will not just be on the 'numbers' but will require description and a justification. However, the guidance will have to emphasise that all arguments will need to be supported such that the selection of the preferred option is fully transparent and auditable.

**Table 5.3 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
The limits of the do-nothing option are not explained in the guidance	It is difficult to specify 'limits' of the do-nothing baseline due to the wide variety of areas that may be appraised. However the guidance needs to emphasise that it is important to think through what would really happen. It is essential not to try and make the do-nothing baseline more 'acceptable' as an option (see also Section 5.3)	Need for good examples of how do-nothing baseline has been defined. Need for guidance to provide support for those predicting what would happen by emphasising importance of realism	Moderate – there is a lot of resistance against the do-nothing option. There needs to be consideration of separating the do-nothing baseline from a walkway option
Approach to assessing the do-nothing option is highly subjective	The do-nothing baseline will always be subjective. The key is in making sure that appraisers apply their knowledge and experience to predict what would 'really' happen. To avoid the baseline being manipulated to increase the potential that a scheme can be justified, the guidance needs to emphasise that the do-nothing baseline has to be one of the first tasks and should be reported prior to assessment of costs and benefits	Need for clear guidance that (engineering) experience is important when assessing the do-nothing baseline. Need to encourage closer working of consultants and project manager to ensure there is no manipulation of the baseline to increase the potential that a scheme can be economically justified	Moderate to difficult – will depend on other changes, including clarification of what the do-nothing baseline is and how it should be assessed. It is also likely to require attitude changes from appraisers, project managers and stakeholders
A lot of time and money is spent on the do-nothing option	This is the key step in the appraisal, but the time and money spent needs to be proportional to the value of the scheme being justified	This links to the need for changes to the emphasis of how the appraisal is undertaken (see Section 4.2)	Moderate to difficult – requires lots of changes to be made and attitudes to change
Social consequences of do-nothing are not taken into account	The social consequences should be described in the do-nothing baseline. They do not have to be quantified or given in money terms to be included in the appraisal, but need to be recorded in a consistent way to ensure they are taken into account in the decision-making stage	Potential to use ASTs to encourage consideration of a more comprehensive set of impacts. This should also help to improve consistency between appraisals	Easy to moderate – ASTs are already developed and can be easily incorporated. More difficult will be getting non-quantified impacts taken into account during decision-making and approval

**Table 5.3 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
<p>The guidance makes it difficult to take some of the costs (e.g. legal costs, costs of making structures safe, etc.) into account</p>	<p>The guidance assumes that the do-nothing baseline is a zero cost option. It would be preferable to separate the baseline from the options and include a walkaway option, where such costs could be included. The walkaway option would be a realistic option including all of the costs that would have to be incurred if it were to be implemented</p>	<p>Separation of the baseline and the walkaway option will mean that the impacts of both the do-nothing baseline and a walkaway option will have to be assessed. This is a more logical approach that will be easier to explain to stakeholders. However, the walkaway option would only be needed if it is not possible to justify doing something, therefore, there is the potential that there would be no change to the number of options being assessed (this approach would ignore environmental benefits from walkaway, etc.)</p>	<p>Difficult – separation of the baseline and walkaway option is easy but the walkaway option requires all of the economic, environmental and social issues to be assessed if it is to provide a robust option. This requires a lot of changes to be made to both the current appraisal process and guidance (see also Section 8.3)</p>
<p>There is very little guidance on the do-nothing option</p>	<p>Some immediate benefits could be gained by providing good examples of do-nothing baselines, use of ASTs to record more impacts and identifying that the baseline is not an implementable option</p> <p>Note though that this will still require changes to the decision rule and the approvers to be willing to accept PARs that propose a preferred option based on argument rather than economics alone</p>	<p>Supplementary note explaining do-nothing is a baseline not an option. Walkaway would be an option, if required (assessed if the BCRs of all options are less than 1)</p>	<p>Easy – a supplementary note could be circulated clarifying that do-nothing is not an option and including ASTs to ensure social and environmental impacts of do-nothing are fully assessed</p> <p>More difficult will be in changing attitudes when the non-quantified benefits are taken into account in decision-making</p>

**Table 5.3 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
One person will decide on one set of events; a different person or different office would use a completely different set of events	It is important that an experienced appraiser is involved in the development of the do-nothing baseline and that this is done in consultation with others, including local stakeholders and those who know the area. Clarifying that it is a baseline not an option may help to avoid exaggeration of the impacts to some extent although expert judgement will still be required to develop a realistic do-nothing baseline	Guidance on do-nothing as a baseline and use of ASTs will help with consistency, as would use of good examples as they are developed. A clear approach to consultation is needed, with the consultants listening to the views of local people not telling them what will happen to encourage a productive working relationship	Easy to moderate – requires the supplementary note and ASTs to be in place to form the basis for consultation, but is still likely to be tendency for over-exaggeration of impacts due to the emotional aspects of flooding and erosion

### 5.3 Would other definitions of the baseline scenario be more appropriate?

#### What is the problem?

Table 5.4 summarises the problems related to the use of other baselines. The significance of each problem is also indicated in terms of how it affects the approach being used and its influence on the outcome of the appraisal. The table draws in evidence from consultation and the review of PARs, other guidance and the existing set of FCERM guidance.

**Table 5.4 What is the problem?**

Problem	Significance in terms of ...	
	Approach used	Appraisal outcome
Use of a do-minimum baseline would reward those who have not maintained their defences	Medium	High
Do-nothing damages are often completely false. The extent to which they reflect what would actually happen varies but can be extended to a complete disaster situation to help justify doing something	High	High

Table 5.4 shows that the do-nothing baseline raises concerns over the potential to which it can be manipulated to provide justification for schemes. However, the alternative of a do-minimum baseline is not without problems.

Most of the appraisal processes and guidance documents used in other fields use either do-nothing or do-minimum as the baseline. Do-nothing (described as

the absence of any measure of control or intervention) is used eight of the appraisal process used in other fields, with do-minimum used in a further eight. The DfT (2001) guidance used for ports takes the do-minimum option as the baseline, taken as current investment. Similarly, DfT guidance on road schemes (particularly COBA, DfT (2002)) uses do-minimum as the baseline, where this is taken as the existing road network without modification (in which case it also reflects the do-nothing). COBA also includes consideration of increasing traffic growth over time in the baseline. The COBA manual sets out four situations where the do-minimum may differ from the do-nothing (DfT 2002):

- where works would be carried out regardless of whether or not the 'do something' scheme is built (e.g. where there is a firm commitment to improving the existing road network);
- where the existing network could be improved to form a 'do-minimum' scheme which is an alternative to carrying the do-something scheme (e.g. where a literal do-nothing scheme would represent a unrealistically poor baseline for comparison). In such cases, it is recommended that the do-minimum should be appraised against a literal do-minimum;
- where traffic conditions can be improved without significant capital expenditure; and
- where the area covered by the network includes road proposals other than the one under immediate consideration. The networks should include planned improvements elsewhere in the network in the year they will be open.

Other appraisal processes use 'business as usual' as the baseline. Such baselines usually include some projections of future changes, such as Defra (2001). This includes emission projections of particles into the air to 2010 and beyond, incorporating the impact of currently agreed policy measures.

The next step is to identify the causes of the problem, in order to determine if the problem can be solved by changes to the guidance or requires other changes to be made.

### **What are the causes of the problem?**

Table 5.5 sets out the cause of each problem identified in Table 5.4 as having an effect on whether using other definitions of the baseline scenario would be more appropriate. This draws on evidence from consultation, in particular the workshops. The table provides an indication of the extent that each cause is driving the problem.

**Table 5.5 What are the causes of the problem?**

<b>Problem</b>	<b>Causing problem</b>	<b>Influence on problem</b>
Use of a do-minimum baseline would reward those who have not maintained their defences	Lack of maintenance would mean that the defences would be in a worse condition than if they had been maintained such that works would be needed sooner	High
	Use of a do-minimum baseline could be more complicated since there are an infinite number of do-minimum options – what should be used as the baseline, moving as far towards do-minimum as possible takes you back to do-nothing	High
Do-nothing damages are often completely false. The extent to which they reflect what would actually happen varies but can be extended to a complete disaster situation to help justify doing something	Lack of guidance on how to assess the do-nothing damages, including what to include, how far to go, etc.	High

Table 5.5 shows that the main problems with the current baseline are linked to the lack of guidance covering what should be included, how and when. Possible solutions to this problem assuming that do-nothing remains the baseline are given in Section 5.2. Moving to a different baseline, particularly do-minimum, brings its own problems including the potential that areas where maintenance has not been carried out could get preferential treatment as a result of the economic appraisal.

The next step is to consider what solutions are required to tackle the causes of the problems.

### **What are the solutions?**

Table 5.6 sets out potential solutions for each cause and each problem. Some of the causes require more than one solution, or have alternative solutions. For each solution, action that can be taken is described with the ease of implementation also given (ranging from easy to difficult). Where possible, the solutions are linked to existing process or appraisals. Evidence of the solutions is drawn from consultation, and from the review of guidance documents and appraisal processes used in other fields.

Table 5.6 shows that there are possible solutions to all of the causes of the problems. Many of these solutions require other actions to be put into place such that the changes will take time.

There are two main alternative baselines that could be applied:

- do-minimum; and
- continue current practice/business as usual.

Do-minimum was identified in the workshops as being a more meaningful economic measure but this raises issues of how to define it such that the impacts can be determined. There may also be problems in terms of different appraisals having different baselines, making comparisons of appraisals very difficult. This may be even more of an issue with 'continue current practice'.

In parallel with the work on this Evidence Base project a paper short paper was prepared to set out some of the arguments for and against switching to the do-minimum as a baseline. The paper is included as Annex 1. The paper was in response to a recommendation in the Zero Based Review (ZBR) which stated:

*[since] “do nothing” and “do minimum” are already considered as alternatives in the development of options in the current scheme appraisal system, the identification and use of the correct counterfactual should be feasible and this approach should be adopted as soon as possible.*

The conclusions from that paper where that moving to a do-minimum baseline did not address any of the concerns identified from consultation as described in Table 5.2 for the following reasons:

- uncertain: it is difficult to define do-nothing but do-minimum is equally difficult to define (see below);
- unrealistic: there are questions over what maintenance can achieve over time with degrading defences, changing defence conditions under different maintenance regimes; and
- false: assumptions are still required about what will happen and when under a do-minimum maintenance regime and predicting the impacts is unlikely to be any easier than under do-nothing.

It was therefore concluded that using do-minimum as the baseline would not solve the problem but could add to concerns because the first question to answer would be 'what is do-minimum'. There could be a number of answers to this (list not exhaustive):

- carry on maintenance as at present;
- minimum expenditure to maintain the defence but standard will fall over time;
- maintain the asset in its built condition;
- maintain the asset for as long as is practical and then revert to do-nothing;
- or
- provide warnings to reduce risk and ignore condition of defence.

The conclusion was therefore to keep the do-nothing baseline as the do-minimum has at least as many uncertainties as the do-nothing and as powers are permissive do-nothing is, on the face of it, a realistic option.

There would also be problems in terms of different appraisals having different baselines, making comparisons of appraisals very difficult. This may be even more of an issue with 'continue current practice'.

An alternative to applying a different baseline to all appraisals would be to use different approaches according to the level at which a decision is being made. Thus, at the high level (e.g. plan), do-nothing could be used as it would be necessary to show whether there is a justification to defend the area or prevent erosion. This would identify the most appropriate policy option. At the strategy level, the appropriate standard of protection would be identified using either the do-nothing or the do-minimum. Since it is likely to be necessary to compare strategies across the country, it may be preferable to continue with do-nothing, taking into account the changes discussed in Section 5.2. The scheme level could then use cost-effectiveness analysis to identify the least-cost way of meeting the appropriate standard of protection (where least-cost would include not just the capital and maintenance costs but also any environmental and social impacts associated with the short-listed schemes). The impacts of the proposed schemes would be assessed against continue current practice or some other baseline such as maintaining the asset in the condition for which it was designed.

A similar approach could be taken for coastal erosion where the project level appraisal would identify the least cost method of implementing the policy defined at the higher level (either stop erosion or allow erosion at a defined rate).

Potential to do this will depend on where the funding decision is made. If funding decision was moved up to the plan level then do-minimum as baseline for strategies could be more easily implemented (as there is no need to compare appraisal results).

**Table 5.6 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
Lack of maintenance would mean that the defences would be in a worse condition than if they had been maintained such that works would be needed sooner	Using a risk-based approach and based on the economic principle of sunk costs, the selection of which schemes to implement should be based on need. The key issue is whether the savings made by not undertaking maintenance would result in increased costs earlier on. If so, it is important that the implications of cuts in maintenance are fully investigated at the time they are proposed	Not a guidance issue	Not relevant

**Table 5.6 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
<p>Use of a do-minimum baseline could be more complicated since there are an infinite number of do-minimum options – what should be used as the baseline, moving as far towards do-minimum as possible takes you back to do-nothing</p>	<p>A minimum do-minimum would have to be defined in detail to ensure it is not misinterpreted. There may be a problem where all appraisals do not fit the definition of the baseline and an alternative is needed. An alternative would be to ‘continue current practice’ but this would mean that appraisals would be using different baselines making them difficult to compare</p> <p>A better approach may be to consider having different baselines at different levels, where do-nothing is used to determine whether there is justification to do-something. It would then be necessary to identify what is needed and the most cost-effective way of meeting the preferred solution</p>	<p>Need for a clear, concise definition of the baseline on an agreed do-minimum basis</p> <p>Alternatively, do-nothing could be used at the high level (e.g. plan) to identify if action is justified. The next level would then consider what is to be done, this could be against do-nothing or do-minimum. Once the preferred option has been determined (e.g. a particular standard of protection), the next level of appraisal would be to identify the most cost-effective means of achieving that option</p>	<p>Moderate – would require consultation with appraisers and comparison of a wide range of schemes to obtain definitions that are applicable to as many situations as possible</p> <p>Moderate to difficult – would require complete change in appraisal process and guidance. Difficulties may arise where schemes are undertaken before strategies, etc.</p>
<p>Lack of guidance on how to assess the do-nothing damages, including what to include, how far to go, etc.</p>	<p>Guidance would have to be provided on all of the issues for any alternative baseline that is proposed</p>	<p>Will require clear guidance, using examples where possible</p>	<p>Moderate to difficult – will require definitions of new baseline to be agreed first then will need development of guidance</p>

## 5.4 Overall solutions

The ‘do-nothing’ baseline and especially the assessment of the impacts over time, the uncertainty of what will happen and the potential for manipulation are all areas of concern at the lack of clear guidance. There is a need for clearer guidance and methods that help the appraiser realistically identify as many impacts as possible.

There is a growing body of opinion that ‘do-nothing’ may not be the most appropriate baseline and do-minimum or present practice should be used as in

some other fields. This does not obviate the need for clear guidance, understanding and experience whatever baseline is used.

The separation of the baseline from an option that could be implemented is also proposed and this has arisen from experience where there are costs associated with the 'do-nothing' option. This walkaway option would have the same effects as 'do-nothing' but would identify the costs of consultation, dealing with public concern and in extreme cases the costs of re-housing, etc. The use of the walkaway option would help to solve the perception and acceptance problems currently posed by using do-nothing as an option. This is shown in the PARs where many of the reports appear to put as much effort into describing why do-nothing is not appropriate as they do in describing the impacts. It does this by providing some 'middle ground' between incurring no costs (which is generally only a theoretical possibility) and providing what could be termed an exit strategy (i.e. it would require timed and programmed action which would incur some cost, but which would be less expensive than doing something). The use of walkaway as an option also enables the appraisal process to consider the full costs of not providing protection in a more transparent manner. The views of local stakeholders can be taken into account providing a more inclusive basis that could involve consideration of novel approaches and/or encourage contributions such that a do-something option may become economically justifiable. The main risk with using walkaway as an option when it has been shown that there is no economic justification for providing defences is that the local community may already be defensive and may not cooperate. They may also be aware that providing additional pressure will increase the costs of walkaway and, thus, the potential that something will be done as it would be less expensive. The timing of stakeholder engagement is likely to be key to ensuring that walkaway is a realistic, implementable option.

The need to compare projects nationally has dictated the existing 'do-nothing' baseline but it would be possible to move to an approach where the investment decision is made at the plan or strategy level. The appraisal at the next level down, where there is then no need to compare nationally, would use cost-effectiveness analysis rather than cost-benefit analysis which could include wider issues such as sustainability and optimisation. It is important that the least cost option when using cost-effectiveness analysis, includes not just the financial costs associated with implementing an option but also includes all of the dis-benefits (where these may not always be easily monetisable). There is a risk that the dis-benefits of options could be overlooked or not considered sufficiently when determining which option is 'least-cost'. This links to current problems in terms of including impacts that cannot be easily valued in money terms (see Section 8).

## 6. The options

### 6.1 What does the current guidance say?

The need to develop a full set of technically and operationally viable options is identified in FCDPAG1 (S4.3) as: *'vital if a comprehensive and meaningful approach is to be undertaken.'* However, there is no guidance on types of options that could/should be considered.

FCDPAG2 states (S3.4.2) that: *'All reasonable and significant options to address the strategic objectives should be investigated'* and then gives examples of types of options that could be considered. It develops this further by commenting (S3.4.3) that: *'The development and appraisal of options is an iterative process leading to a set of alternative solutions where technical aspects, costs, benefits, environmental and other impacts have been assessed and appropriate allowances made for any uncertainty'*.

FCDPAG3 states (S3.2) that: *'In the early stages of analysis the range of options should be as wide as possible and the process of analysis may suggest new options.'* It identifies the need for options with different design standards or probabilities of failure and identifies screening to reduce the number for detailed analysis. Examples of an appropriate range of options to be normally included are given as:

- *different standards of protection;*
- *alternative alignments;*
- *alternative timing of works;*
- *different approaches to solution of the problem.*

FCDPAG4 only deals with the appraisal of options and provides general information on risk based approaches within the tiered approach.

The general approach to scheme appraisal is covered in FCDPAG5 as follows (S2.1.1): *'broad option development is required, including consideration of options that deliver environmental benefits or minimise damage.'* It also states (S2.1.4) that: *'prior to commencing detailed economic analysis, it is important to ensure that all appropriate options have been identified.'* The worked examples give possible options for a number of different types of project.

Six policy options are given for consideration when developing CFMPs and each one must be included in the appraisal (Vol I S5.4.6 Box 3).

The SMP2 guidance refers to objective led policy assessment (Ch2) although it generally refers to options as scenarios. The four policy options to be assessed are given (Vol I S2.3) and examples show the type of impacts that could result from each option. SMP1 does not refer to options only policies.

The MCM states (S1.4) that: *'All project appraisal methods involve the comparison of at least two options or alternatives; one is the baseline option which is usually the 'do nothing' option.'* It notes the do-something options and

gives examples of different options throughout (without giving a comprehensive list of option types). The MCH does not cover options but refers to the MCM.

The need to describe the range of options capable of solving the problem is stated in the Project Appraisal Report Guidance (S2.3) but there is no detail on how wide the range of options needs to be. Examples of options for different forms of construction, various types of responses, and the do-minimum option are given together with the need to consider a range of standards.

## **6.2 Are the ‘standards of protection’ representative of the residual flood risk?**

### **What is the problem?**

The issue of residual flood risk is considered in Section 12. This Section focuses on the range and type of options considered, and whether the range of standards of protection assessed is sufficient. It also considers the use of indicative standards and how these inform the selection of options for appraisal and the identification of the preferred option.

The majority of PARs (54 of the 67 reviewed) considered a wide range of options. A total of 56 PARs included the do-minimum option, although it was screened out in seven PARs and not considered in the detailed appraisal. Many of the PARs also do not give the current standard provided under do-nothing, or how this will change into the future (e.g. as defence condition declines, impact of climate change, etc.). A wide range of different option types is typically considered in a PAR, although options such as flood warning are frequently screened out.

Many of the PARs use the indicative standards to determine a range of options to be assessed. For example, for those projects relating to projects in Land Use Band A (the majority), typical options include standards of 1 in 100 and 1 in 200 years. There are numerous occasions where the standard at the bottom of the indicative range is not considered. It is very rare for an additional option to be considered between do-minimum and the bottom of the indicative range (even where no explanation is given as to why the area has been allocated to Land Use Band A). One example has the do-minimum option with a standard of 1 in 5, while the next option considered has a proposed standard of 1 in 50.

Table 6.1 summarises the problems related to residual risk and standards of protection. The significance of each problem is also indicated in terms of how it affects the approach being used and its influence on the outcome of the appraisal. The table draws in evidence from consultation and the review of Project Appraisal Reports and the existing set of FCERM guidance.

**Table 6.1 What is the problem?**

Problem	Significance in terms of ...	
	Approach used	Appraisal outcome
Indicative standards are being used to set the range of standards to be considered	High	High
Non-structural options (e.g. flood warning) are being screened out early on	High	High

The use of options that only consider the indicative standards may result in options being justified that are not the economically optimal solution. This may not only relate to options lower than the indicative standard, but there may be occasions where it is worthwhile protecting to a higher standard. However, it is likely that including options providing lower (rather than higher) standards of protection may be justified (economically) if they were to be assessed. This is more likely to occur where only a narrow range of benefit types has been included in the appraisal (as is often the case in the PARs, see Section 8). Therefore, assessment of options within the indicative standards only may be leading to the 'best' solutions where the most appropriate Land Use Band has been assigned. The review of PARs shows that areas at risk have been assigned to Land Use Band A with 37 or 72 properties at risk, while another area is assigned to Land Use Band B with 96 properties at risk. Using the number of properties per km of coastline/river bank suggests that the second of the PARs assigned to Land Use Band A (with 72 properties at risk) should be allocated to Land Use Band B. Given that the preferred option was to provide a 1 in 200 year standard, it appears that the indicative standard has driven the decision rather than the appraisal process.

The next step is to identify the causes of the problem, in order to determine if the problem can be solved by changes to the guidance or requires other changes to be made.

### What are the causes of the problem?

Table 6.2 sets out the cause of each problem identified in Table 6.1 as having an effect on whether impacts that cannot be valued in money terms are included or not. This draws on evidence from consultation, in particular the workshops. The table provides an indication of the extent that each cause is driving the problem.

**Table 6.2 What are the causes of the problem?**

Problem	Causing problem	Influence on problem
Indicative standards are being used to set the range of standards to be considered	Additional time and data required to assess a wider range of standards	Medium
	Land Use Bands are not being assigned correctly, with number of properties at risk from flooding not being taken into consideration	High

**Table 6.2 What are the causes of the problem?**

Problem	Causing problem	Influence on problem
	There is a desire to provide the highest standard possible, which drives appraisers to only assess higher standards	High
Non-structural options (e.g. flood warning) are being screened out early on	Attitude that non-structural solutions are not as good as structural solutions (not just from engineers but also from stakeholders)	High
	Additional time and data required to assess a non-structural solutions	Medium
	Uncertainty in how to assess non-structural solutions, how to determine and quantify the benefits and whether data sets apply (e.g. damage reductions from flood warning in MCM seem very high)	Medium
	Lack of guidance on flood risk management options as opposed to flood defence – guidance has not matched change in policy	High

Table 6.2 shows that the causes of the problems are wide ranging, from attitudes through available information and guidance, to the availability of time and resources. There is also a human element in that those undertaking appraisals, the project managers, and those approving want to be able to provide the ‘best’ standard of defence possible. This is understandable particularly where flooding problems have been seen and/or consultation with the local community undertaken. Attendees at the workshop identified that it is not easy to remain totally objective when undertaking appraisals when the problems caused by flooding have been witnessed.

The next step is to consider what solutions are required to tackle the causes of the problems.

### **What are the solutions?**

Table 6.3 sets out potential solutions for each cause and each problem. Some of the causes require more than one solution, or have alternative solutions. For each solution, action that can be taken is described with the ease of implementation also given (ranging from easy to difficult). Where possible, the solutions are linked to existing process or appraisals. Evidence of the solutions is drawn from consultation, and from the review of guidance documents and appraisal processes used in other fields. The review of PARs is also used where one (or more) PARs have included impacts that could not be easily valued, suggesting that approaches are already available that could reduce or remove the problems.

Table 6.3 shows that there are possible solutions to all of the causes of the problems. Many of these solutions require other actions to be put into place such that the changes will take time.

The changes required to ensure that an appropriate range of options is considered and that non-structural solutions are assessed alongside structural solutions are likely to be linked to changes in the emphasis from flood defence to flood risk management. This is a required change in the guidance due to changes in policy. However, wording changes in themselves are unlikely to be sufficient to encourage greater consideration of non-structural solutions. Presently, these solutions are included in the long-list of options, but are screened out early on. Many of the PARs do not give detailed reasons why non-structural solutions have been screened out. Of those that do, reasons include that the flood warning time would only be sufficient for evacuation and would not affect damages, therefore, it is not considered further. This highlights a problem with the current appraisal process, which does not take into account benefits from reduced risk to life such that flood warning would appear to have no (monetary) benefit over do-nothing as it would not reduce property damages.

**Table 6.3 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
Additional time and data required to assess a wider range of standards	Adding in additional standards where the Land Use Band has been correctly allocated may not be worthwhile. This again highlights the need to focus on risk and uncertainty when undertaking the appraisal, rather than comparing predefined options and choosing one	Requires revision of appraisal process to refocus efforts onto using risk and uncertainty to define what options are assessed in detail	Moderate to difficult – needs a lot of changes to be made to both appraisal process and guidance (see also Section 4)
Land Use Bands are not being assigned correctly, with number of properties at risk from flooding not being taken into consideration	The use of number of properties per km of coastline/river bank is misleading particularly for very short frontages and can lead to areas being assigned to Land Use Band A when this is not really appropriate. Also needs to be greater focus on the number of properties at risk	Requires revision of description of Land Use Bands, with more examples, illustrating what is/is not in each band	Moderate – there will always be cases that are difficult to allocate, key is to make the land use bands reflect risk
There is a desire to provide the highest standard possible, which drives appraisers to only assess higher standards	This is human nature and is difficult to address other than requiring all decisions to be justified, including why the area has been assigned to a particular land use band	Needs more emphasis on transparency of PARs. Many do not currently report which land use band they have used	Moderate – needs change of approach and greater confidence from appraisers when preparing PARs (see also Section 8.3)

**Table 6.3 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
<p>Attitude that non-structural solutions are not as good as structural solutions (not just from engineers but also from stakeholders)</p>	<p>Reflects lack of experience and confidence in non-structural solutions, which will only be addressed when flood warning, etc. are tested in flood situations. Need to understand why non-structural solutions are being screened out completely. Need to emphasise in guidance that combinations of options can be used and that the non-structural solution does not have to deal with the whole problem. Guidance can provide some assistance and good communications may help to alleviate concerns of stakeholders</p>	<p>Requires testing of non-structural solutions in flood situations. Problem is there is perceived greater risk that things could go wrong, which may lead to court proceedings, etc.</p>	<p>Difficult – need to encourage combinations of solutions (structural and non-structural) until non-structural have an opportunity to show they can work</p>
<p>Additional time and data required to assess non-structural solutions</p>	<p>Need for change in emphasis to that based on risk and uncertainty so that non-structural solutions can be included within combinations (or as standalone options) as appropriate</p>	<p>Requires lots of other changes to be put in place to change focus of appraisal process.</p>	<p>Moderate to difficult – lots of other changes are needed (see also Section 4)</p>
<p>Uncertainty in how to assess non-structural solutions, how to determine and quantify the benefits and whether data sets apply (e.g. damage reductions from flood warning in MCM seem very high)</p>	<p>Need for guidance on how non-structural solutions should be assessed, including the need to take account of the probability of success (e.g. of temporary defences)</p> <p>Need for testing of datasets and/or inclusion of likely uncertainty associated with them. Also use of ASTs to encourage inclusion of those benefits that are more difficult to quantify so they can be taken into account at the decision-making stage</p>	<p>Need to link assessment with existing processes and extend, rather than have new guidance</p> <p>Information on data sets could be provided but needs to be used. This may require worked examples to help feed into benefits assessment using ASTs</p>	<p>Easy to moderate – ASTs are already developed but will require help in how to use them for those benefits that are difficult to quantify; need to link to assessments of non-structural solutions that have been undertaken</p>
<p>Lack of guidance on flood risk management options as opposed to flood defence – guidance has not matched change in policy</p>	<p>Need for change in emphasis in wording of guidance, move to flood risk management and inclusion of examples with non-structural solutions</p>	<p>Will take place as guidance as revised due to change in policy</p>	<p>Easy to moderate – requires change in emphasis and maybe thinking from some</p>

### 6.3 Overall solutions

Inclusion of a wider range of options needs to be linked to a change in the way that the appraisal process is currently undertaken. Otherwise, the requirement for more options to be assessed will only add to the time and money being spent (which is already perceived as being too high). Thus, small changes to the guidance are unlikely to result in improvements to appraisals and may not be identified or used by practitioners due to time constraints. Consultation has identified that there is a need for greater emphasis on flood risk management and the associated use of non-structural solutions. However, there are also issues in terms of confidence with non-structural solutions that will be difficult to solve through guidance. The use of ASTs to allow non-quantified benefits to be included could help, as could the inclusion of impacts such as loss of life or risk of injury. This would help to emphasise differences between structural and non-structural solutions. This is also likely to require additional guidance showing how the benefits of non-structural solutions can be calculated, particularly where their overall success is dependent upon a series of events being completed, e.g. temporary defences. As this is not currently picked up it may unjustifiably suggest that non-structural solutions should be screened out as they have no additional benefits, when in fact they do – they are just not represented through the use of the MCM depth-damage values. This highlights the potential influence of screening and its role as part of the options selection process. It is important that screening forms an integral part of the options selection and revision process but that potentially effective options are not screened out without proper justification.

Non-structural solutions may benefit from inclusion in cost-effectiveness analysis, rather than cost-benefit analysis as is undertaken in the Netherlands. Such an approach makes the inclusion of non-monetisable benefits (and costs) easier to take into account and would help to encourage combinations of structural and non-structural options to provide the optimal solution. This requires changes to be made in other areas of the appraisal, such as the baseline (see Section 5) and the way that costs and benefits are identified, described and valued (see Section 8).



## 7. Screening

### 7.1 What does the current guidance say?

FCDPAG1 notes the implications of not fully discussing options in the appraisal report or presenting reasons for their rejection (S8.3, Example 8, pg 31): *'All options considered should therefore be documented in the appraisal report (or strategy plan). If options are eliminated in the development, comparing or selection stage, reasons for this also need to be documented so that a clear audit trail of the appraisal process is retained'*. However, there is no guidance on what reasons for screening out could be.

The development of options is covered in FCDPAG2 (S3.4.2, S3.4.3) and should be creative, lateral, and iterative. No specific examples or reasons for screening are given.

An indication of the of options to be considered is given in FCDPAG3 (S3.2) with a general statement on screening: *'Although it is good practice to start with a wide range of options for several different standards of defence, these can usually be quickly reduced to a smaller range of standards and options for detailed analysis. For example, in economic terms, the solution with the lowest present-value cost will be the most cost-effective solution for any particular standard'*. There is no other guidance on how to reduce the long-list of options and no reasons for screening given.

FCDPAG4 deals with how risks can be identified, eliminated and the most important ones identified through risk screening. Insignificance of risk is given as an example to screen out at early stages. The specific use of risk to screen options, for example for reducing a long list to a short list, is not covered but the use of a matrix approach for comparing options is given together with an example (S4.8).

FCDPAG5 notes that when considering options, it is important to pay particular attention to the reasons for designation [of a feature of interest] (S2.1.4) and states that: *'Where initial consideration suggests that an option is likely to be particularly environmentally damaging, it should not normally be taken further'*. The need for an appropriate degree of appraisal at the strategic level is covered in S2.2.1 as a way of reducing the risk of unacceptable options/schemes being considered.

No guidance on screening is given in CFMP or SMP Guidance or in the MCM or MCH.

The Project Appraisal Report Guidance states that options can be discounted with a justification and then do not need further consideration. It adds that: *Real constraints on the number of options selected must be explained e.g. time, legal, safety, political or environmental'* and *'general statements such as "not acceptable" or "too expensive" are not sufficient'*. (S2.3).

## 7.2 Is screening of unacceptable options undertaken during the initial phases of appraisal?

### What is the problem?

The majority of PARs (40 out of 67) reviewed undertook some sort of screening during the appraisal. However, 26 PARs did not undertake screening or did so only partly. Five of those where screening was undertaken partly did not provide reasons why options had been screened out, or the reasons were not clear/convincing. The methods used to screen options differed significantly, ranging from those that considered technical, environmental and economic criteria when screening to those that considered only one of these, or linked screening back to the objectives. Screening by objectives can work well, but in some cases the objectives were in themselves leading (e.g. to provide a 1 in 100 standard), resulting in what could have been very cost-effective options being screened out early on.

Cowbridge & Llanbethian PAR uses a multi-attribute technique (MAT) to screen options, comparing options individually to determine the likely extent of benefits and dis-benefits. This allowed them to screen from thirteen capital scheme options to three. The MAT assessed each option for benefits in terms of water quality, aesthetics, recreation and amenity, conservation and ecology, expectations of the scheme and the preliminary cost-benefit analysis, and for dis-benefits (lead time for scheme, complexity of design and construction, construction costs, operation costs, maintenance costs, land take and effects on community).

Table 7.1 summarises the problems related to screening of unacceptable options. The significance of each problem is also indicated in terms of how it affects the approach being used and its influence on the outcome of the appraisal. The table draws in evidence from consultation, the review of Project Appraisal Reports and the existing set of FCERM guidance.

**Table 7.1 What is the problem?**

Problem	Significance in terms of ...	
	Approach used	Appraisal outcome
Non-structural issues are not included in early PAR planning stage	Medium	High
Screening can result in options that could be very cost-effective being screened out early on	High	High

Table 7.1 shows that many of the most significant problems relate to the way that options are screened, but also to the list of options that is considered in the first place.

The next step is to identify the causes of the problem, in order to determine if the problem can be solved by changes to the guidance or requires other changes to be made.

## What are the causes of the problem?

Table 7.2 sets out the cause of each problem identified in Table 7.1 as having an effect on whether impacts that cannot be valued in money terms are included or not. This draws on evidence from consultation, in particular the workshops. The table provides an indication of the extent that each cause is driving the problem.

**Table 7.2 What are the causes of the problem?**

<b>Problem</b>	<b>Causing problem</b>	<b>Influence on problem</b>
Non-structural issues are not included in early PAR planning stage	Initial list of options being considered is not wide enough or does not contain non-structural solutions	High
Screening can result in options that could be very cost-effective being screened out early on	Screening being carried out using criteria that consider only one or two aspects rather than being used to eliminate those that are clearly 'worse' at an early stage	High
	Time constraints preventing consideration of a larger number of options	High

Table 7.2 shows that the main problems relate to the initial list of options that is determined, the approach being used for screening and time constraints preventing appraisal of all those options that should not have been screened out.

Organisational inertia in terms of looking at new, innovative and potentially more sustainable options was one of the issues raised in the questionnaires and discussed in the workshops. The lack of emphasis on environmental and social issues, and reluctance to consider what may be untried and untested approaches lead to such options either not being included in the long-list of options in the first place or being screened out early on. For example, one PAR considered the use of managed realignment as an option but then screened it out on the basis that a large town would be flooded. No consideration was given to partial managed realignment (i.e. such that the realignment area would not be the same as the area affected under do-nothing).

The next step is to consider what solutions are required to tackle the causes of the problems.

## What are the solutions?

Table 7.3 sets out potential solutions for each cause and each problem. Some of the causes require more than one solution, or have alternative solutions. For each solution, action that can be taken is described with the ease of implementation also given (ranging from easy to difficult). Where possible, the solutions are linked to existing process or appraisals. Evidence of the solutions is drawn from consultation and the review of guidance documents, and draws on approaches from appraisal processes used in other fields.

Table 7.3 shows that there are possible solutions to all of the causes of the problems. Many of these solutions require other actions to be put into place such that the changes will take time.

**Table 7.3 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
Initial list of options being considered is not wide enough or does not contain non-structural solutions	Need to encourage inclusion of realistic non-structural solutions and potential for combination with traditional options. This may require inclusion of environmental and social criteria in the screening process, but highlights the need for close links between option selection and screening	Some PARs include a wide range of options, which are then screened down. There is a need for encouragement of such approaches as best practice	Moderate-inclusion in best/good practice guidance (see also Section 3)
Screening being carried out using criteria that consider only one or two aspects rather than being used to eliminate those that are clearly 'worse' at an early stage	Need for guidance on the screening process, particularly the consideration of options against technical, environmental, social and economic criteria as a minimum. Project objectives must also reflect all of these issues if screening is to be undertaken in a transparent and appropriate way	Some PARs are including clear approaches to screening taking into account these (and other) factors. Use of library of worked examples linked to screening and objectives would be helpful	Moderate – requires setting up of on-line (or easily accessible) library of reports/or links to good sections of PARs (see also Section 3)
Time constraints preventing consideration of a larger number of options	Need for reduction in complexity of appraisal process (see also Section 4.2 for discussion of revised approach to appraisal based on risk and uncertainty)	Requires appraisal process to be simplified with more points at which options can be screened. This needs to be based on risk and uncertainty so that the appraisal process is used to learn and thus provide a preferred option that performs best for that area, where this may be a combination of bits of options	Moderate to difficult – requires complete review of appraisal process and guidance (see also Section 4.2)

The solution of the issue of options not being included in the appraisal or being screened out early on can be addressed by providing additional guidance on initial option selection and screening to revise and reduce the number of options

being considered for appraisal. However, the issue is not just to do with the approach but also attitudes (particularly towards non-structural and innovative options) and time. Therefore, adding extra guidance may not help to solve the problem, but may be perceived as adding further to the burden of appraisal by preventing options being screened out early on such that they require detailed appraisal. It is important that any additional guidance provided emphasises the links between option identification and screening and includes the potential for combining options (or parts of options) to produce an option short-list.

Many of the guidance documents and appraisal processes used in other fields do not cover screening in detail and do not provide indications of appropriate reasons for screening out of options. Of those that do include screening as a formal step in the appraisal process, the focus is on providing transparency and traceability of decisions, and to use screening as a process for including consideration and comparison of options before they are assessed in detail. HR Wallingford (2006) screens options by comparing them against a set of primary objectives. The primary objectives are set as those that are linked to the basic requirements of the project; in the case of HR Wallingford (2006), this is to ensure that demand for water resources does not exceed supply at various times in the future. The appraisal is then against the other objectives (which cover social, environmental, economic and technical issues). The other objectives are set according to the specific requirements of the project, such that the screening process (and the approach to appraisal of options) varies between projects.

Providing links to PARs that have undertaken more thorough approaches to screening could provide a useful intermediary step. However, this may also be seen as an attempt to add to the time required to undertake appraisal by requiring a detailed screening stage with no potential for future time savings in the appraisal itself (particularly if the requirements for screening out of options become much more rigorous).

The most appropriate approach is likely to be to combine the addition of a more structured screening stage in a streamlined approach to appraisal. This could include more than one opportunity for screening options such that the appraisal forms a learning process. As more details are collected on one option, it could be screened out or combined with other options with the overall aim of moving towards the best approach. This would need to be combined with a review of the appraisal process (such as that described in Sections 3 and 4), with new guidance to support the approach and linked to approaches used when identifying the long-list of options at the outset of the appraisal (see also Section 6).

### **7.3 Overall solutions**

To deal with the issue of screening as part of the wider discussion on option selection and revision, it may be sufficient to provide brief additional guidance, e.g. through a supplementary note, to encourage use of technical, environmental, social and economic criteria when screening. This will also have to refer to the project objectives and the potential for screening by objectives

where these cover the four criteria listed above. Illustrative examples taken from the PARs could be included (as requested during consultation) but care is needed to allow for flexibility in approach. It is also important that any additional guidance is not interpreted as a 'must do', perhaps by giving a range of approaches from simple checklists through to more complex approaches such as multi-attribute techniques. This again highlights the importance of providing guidance on 'what' rather than 'how', with the rules specified but the processes identified by practitioners according to the specific needs of the project (see also Section 3). Making a change to deal with screening issues as part of the option selection and revision process would deal with most of the problems identified above. However, issues such as time constraints would not be solved (and indeed may be exacerbated if the revised approach to screening is more time consuming). There is a risk, therefore, that small changes to screening alone would not result in a significant improvement in the way that appraisals are carried out and reported, or would not be implemented by practitioners because of time/resource pressures due to a lack of changes to other areas.

Where the need is identified to make greater changes to the guidance (e.g. when defining solutions to other areas of the appraisal process), particularly if this is to move towards an appraisal process where decision-making is based on risk and uncertainty, there is the potential to include a more sophisticated approach to screening. This could include initial screening of the long-list of options to remove those options that would not meet the project objectives (or the primary objective of reducing flood risk), followed by further screening/refinement of options to move towards a better solution. This begins to move into optimisation of options but in a way that should avoid the need for repeated appraisals. Such an approach could be included within the design of new guidance, as described in Sections 3 and 4 (with option selection discussed in Section 6 and optimisation specifically considered in Section 11), by including a number of points at which the options are compared (perhaps before deciding to obtain further detail). If bits of the options could be combined to provide a hybrid option that maximises the benefits and minimises the costs, it may not be necessary to undertake the more detailed appraisal, thus providing time savings. Such an approach should help address concerns of appraisers that the appraisal process takes too long and costs too much by changing the focus from assessing individual option towards building up an option through the selection/screening/assessment aspects of the appraisal to provide a revised option (or options) that best addresses the requirements of the project. This would help to address all of the problems raised as being related to screening as part of the overall appraisal process, building screening into the approach in a formal way.

## 8. Assessment of damages and benefits

### 8.1 What does the current guidance say?

FCDPAG1 does not directly cover benefits but notes that ‘if all significant factors in the project appraisal can be satisfactorily expressed in monetary terms, the benefit-cost calculations are the most appropriate basis for decision making. However, if this is not the case, economic considerations should be viewed in the context of other factors if the most appropriate decision is to be made’ (S5.1).

FCDPAG1 also notes that ‘if all significant factors in the project appraisal cannot be satisfactorily expressed in monetary terms, an alternative basis for decision making must be determined’ (S5.2). This includes the use of multi-criteria analysis, which is further described in FCDPAG4 (S3.3.3).

FCDPAG2 (S3.4.7) explains how to identify benefits and types of benefits that may occur and explains approaches (S3.4.6) to valuing benefits in non-money terms. The consideration of a wide range of issues based on importance is also encouraged (S3.4).

FCDPAG2 notes that: *‘assessments should include all direct and indirect consequences and impacts for all options, whether costed or not, and should also identify non-costed impacts...The economic value of tangible benefits should be assessed using recognised approaches such as those recommended in the Middlesex University manuals. Intangible benefits and impacts can be significant particularly those relating to recreation and the natural and historical environment’* (S3.4.7).

Assessing the benefits is covered in FCDPAG3 (S4) and sets out the approach to valuing benefits in money terms. Streams of costs and benefits are also discussed (S3.7.3). A wide range of different benefit types is described, but the focus is on how to monetise impacts with discussion based on uncertainty around estimates.

Most of the discussion in FCDPAG3 focuses on how to monetise impacts but Section 4.1.7 discusses non-monetary impacts on households. This includes ‘increased stress, health damage and loss of memorabilia’ (S4.1.7). The focus is then on ways of using surrogate values to attempt to place a monetary value on these impacts.

In terms of environmental impacts, FCDPAG3 notes that ‘whether valued in money terms or not, environmental impacts should always be considered’ (S4.2.2). Again, the guidance then sets out how to place an explicit economic value on an environmental site or asset, but does note that ‘it may not always be possible to express all use and non-use values in monetary terms, or even to quantify them meaningfully in some other way, and this should be taken account in the overall appraisal’ (S4.2.2). Further discussion on

environmental valuation is given in Section 3 of FCDPAG5, with a detailed approach to assessing habitat replacement costs set out in Section 4.

A tiered approach is proposed in FCDPAG4 with type/extent of assessment to suit severity of risk (S4.6). S3.2, 3.3 and 4.8 explain how to include non-monetised benefits in the appraisal, including examples. Examples show (S3.2.4, S3.2.5) how probability and consequence can be characterised and assessed. It provides a range of quantitative and qualitative approaches, e.g. MCA (S3).

FCDPAG5 notes that impacts that cannot readily be valued in monetary terms still need to be taken account of properly in the appraisal process. Environmental valuation is discussed (Ch3) and explanation is given on how to determine habitat replacement costs. MCA and descriptive approaches are mentioned and different non-monetary approaches are also covered (S3.1.3).

Catchment Flood Management Plans follow an objective-led approach to appraisal, with the use of Integrated Policy Appraisal (IPA) recommended as an approach to scoring and weighting (Volume II, S12.1.1). No guidance is given, however, on the weightings to be used. Limited guidance on how to identify benefits of each option and the types of benefits that might occur is given (Vol 2 S8.7). MDSF is used to value flooding of business and agriculture. Other benefits are not valued. Benefits are also to be identified using an objective-led appraisal process.

For Shoreline Management Plans, the consideration of benefits is included in Appendix H, which also includes discussion on different approaches to objective assessment that could result in the inclusion of non-monetised impacts.

The MCM includes a section on the intangible effects of flooding, noting that *'the intangible effects of flooding are now recognised to be significant'* (S4.4). The MCH provides similar information to the MCM (S 4) and like, FCDPAG3, both the MCM and Handbook suggest the use of surrogate values for intangible impacts. Ch3 covers the theory and practice behind flood alleviation benefits with the economic principles behind appraisal explained in Ch2. The MCM explains how values are measured (S2.7). Actual benefit values are given in the subsequent chapters/on the CD.

Project Appraisal Report Guidance does not explain how to identify benefits, but gives examples (environmental/recreational enhancements, agricultural enhancements). The approach to valuing benefits refers to compliance with FCDPAG3(S2.5). Benefits that have been quantified need to include an explanation as to how this has been done. Qualitative benefits need to be described in terms of relative importance. The guidance allows avoidance of valuing difficult/intangible benefits but suggests that sensitivity testing is used to check the decision.

## 8.2 Are all significant benefits and costs properly assessed?

### What is the problem?

Of the 67 PARs reviewed, 57 described how each option had been costed or gave costs for the preferred option, while 44 included details of the benefits of each option. In terms of the costs, the PARs tend to include very detailed information, with contractors often having been involved to provide and/or verify cost estimates. Some projects included cost workshops (e.g. Canvey Island Drainage). In contrast, the benefits are usually described very briefly, such that 23 PARs did not provide details of the benefits of each option.

Only 12 of the PARs considered the likely significance of the benefits before assessing them in detail, although a further 8 PARs did do this to some degree.

Almost all of the PARs (63) included monetised benefits but only 18 include non-monetary benefits outside of the Environmental Impact Assessment. The types of damages/benefits included however highlight the incompleteness of most benefit assessments. A total of 56 PARs included residential property damages while 50 include non-residential property damages (commercial, industrial, etc.). However, only 13 PARs stated that they included costs to emergency services, which is interesting as the damages are estimated by multiplying residential damages by 10.7%. Therefore, it should have been very easy for all those PARs including residential damages to also include costs to emergency services. In a number of examples, many of the properties under do-nothing are written-off, which may explain why costs to emergency services have not been included<sup>1</sup>.

Other benefit types have been included in fewer PARs: agricultural damages in 14 PARs; traffic/transport disruption in 12 PARs (road and/or rail); recreational benefits in just four PARs; environmental and habitat benefits in four PARs; and stress/health impacts in just one PAR.

In terms of agricultural damages, although 14 PARs reported including them in the appraisal, only seven confirmed that they adjusted the benefits for subsidies (further details may have been available in the appendices, which were not available for all of the PARs reviewed).

Table 8.1 summarises the problems related to inclusion of all significant benefits and costs. The significance of each problem is also indicated in terms of how it affects the approach being used and its influence on the outcome of the appraisal. The table draws in evidence from consultation, the review of Project Appraisal Reports and the existing set of FCERM guidance.

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<sup>1</sup> However, any comparison of do-something options would benefit from inclusion of costs to emergency services. In particular, this will increase the incremental benefit-cost ratio of those options providing a higher standard of protection.

**Table 8.1 What is the problem?**

Problem	Significance in terms of ...	
	Approach used	Appraisal outcome
Inconsistent consideration of benefit types in appraisal	High	High
Potential that benefits are being estimated without correction for adjustments (e.g. subsidies)	Medium	Medium
Benefits for which money values are available are not being included (e.g. recreation, health and stress)	High	Medium
Benefits are not being considered or reported to the same detail as costs	High	High

Table 8.1 shows that many of the most significant problems relate to inconsistency between different appraisals. There are also issues in terms of the appropriate level of detail within appraisals, where a lot of time appears to be spent on obtaining cost estimates (including refinement of optimism bias), but much less apparent effort in terms of benefits. Note though, this may also be to do with reporting of the appraisal in the PAR.

The next step is to identify the causes of the problem, in order to determine if the problem can be solved by changes to the guidance or requires other changes to be made.

### **What are the causes of the problem?**

Table 8.2 sets out the cause of each problem identified in Table 8.1 as having an effect on whether impacts that cannot be valued in money terms are included or not. This draws on evidence from consultation, in particular the workshops and detailed questionnaire. The table provides an indication of the extent that each cause is driving the problem.

**Table 8.2 What are the causes of the problem?**

Problem	Causing problem	Influence on problem
Inconsistent consideration of benefit types in appraisal	Lack of coordinated guidance on the type of impacts that could occur and how to assess them	Medium
	Perception that other benefits only need to be assessed if 'traditional' property damages are insufficient to justify the scheme	High
Potential that benefits are being estimated without correction for adjustments (e.g. subsidies)	Complicated and detailed approach to estimating benefits, e.g. agriculture	Medium
	Lack of reporting in PAR on adjustments made	Low

**Table 8.2 What are the causes of the problem?**

<b>Problem</b>	<b>Causing problem</b>	<b>Influence on problem</b>
Benefits for which money values are available are not being included (e.g. recreation, health and stress)	Perception that benefits are small and so will have little effect on the selection of the preferred option	High
Benefits are not being considered or reported to the same detail as costs	Perception that costs can be predicted more accurately and that decision is mainly based on costs	High
	Perception that use of MCM will generate large benefits reasonably quickly. Providing more detailed benefit estimates will require a significant amount of additional time and the additional benefits will be small	High
	Perception that do-nothing option can be manipulated to increase the damages as required to improve the justification of a scheme	Medium

Table 8.2 shows that the main problems are related to perception issues, in particular that the decision is likely to be driven by damages to property and that other benefits are likely to be small. This may indeed be the case in many situations and when other benefits are compared against the do-nothing damages. However, some benefits such as health and stress are linked to the standard of protection being provided. This means that while they may not affect the benefit-cost ratio of the scheme significantly, they could result in much higher incremental benefit-cost ratios. This could make the difference between having an economic case to move to an option providing a higher standard of protection and not having an economic case. There also seems to be the perception that the choice of preferred option is based on economics only and that other (non-monetised) impacts cannot be included at the decision-making stage. This may be as a result of use of the decision rule in FCDPAG3, which does not explicitly include consideration of non-monetised impacts when selecting the preferred option.

Eight of out eleven respondents to the detailed questionnaire agreed with the statement that there is no guidance on how to include environmental and social issues. One comment focused on the influence of the priority score stating *'the perception is that, at the approval stage, if the basic economic outcome for an individual scheme is not the best when compared with others it will not progress. Priority scores are fundamentally economic measures'*. One other respondent noted that guidance is available (in FCDPAG3, supplementary guidance notes and FCDPAG4, as well as English Nature documents), but that these need to be made more accessible. More than one-third of respondents (34%) believed the lack of inclusion of environmental and social issues was a wider (i.e. non-guidance) issue, with no respondents stating that it was solely a guidance issue.

More than one-quarter of respondents (25%) believed non-inclusion of environmental and social impacts was a key or very important issue. Comments included:

- it could be hindering the selection of the truly preferred option and therefore hindering good decision making;
- need to achieve balanced project appraisal; and
- the environment is becoming more important and (inclusion of environmental and social issues) would help encourage environmental enhancements as scheme goals.

The next step is to consider what solutions are required to tackle the causes of the problems.

### **What are the solutions?**

Table 8.3 sets out potential solutions for each cause and each problem. Some of the causes require more than one solution, or have alternative solutions. For each solution, action that can be taken is described with the ease of implementation also given (ranging from easy to difficult). Where possible, the solutions are linked to existing process or appraisals. Evidence of the solutions is drawn from consultation, and from the review of guidance documents and appraisal processes used in other fields.

Table 8.3 shows that there are possible solutions to all of the causes of the problems. Many of these solutions require other actions to be put into place such that the changes will take time.

Many of the issues with benefit estimation could be addressed through the use of Appraisal Summary Tables (ASTs). These encourage a consistent and comprehensive overview of all impacts that could occur under the do-nothing baseline and all do-something options. Tables are already in use in FCERM, e.g. in the MCA approach which is currently being piloted by the Environment Agency. The Sugden approach is also using ASTs as a way of encouraging comprehensive consideration of all impacts. The AST developed for the MCA project (FD2013) was based on the categories used in the Environmental Impact Assessment, thus it also helps to bring the results of the EIA into the project appraisal (see also Section 8.3).

It is important that the AST is used as the basis for summarising key impacts, not just in descriptive (qualitative) and quantitative terms, but also as the source of information that would allow benefits to be estimated in money terms, where this is appropriate. The advantage of ASTs is that they allow all significant impacts to be described in a structured manner and include the assumptions used when quantifying and, potentially, monetising benefits. This can help to avoid the temptation to try and place a money value on those impacts that cannot be reliably valued in that manner, since the AST provides a mechanism for recording all of the impacts in one place, making comparisons between options much more comprehensive.

More difficult to address will be the perception that many benefits (outside of property damages) are likely to be small. It is important, therefore, that guidance accompanying the ASTs is clear, not just about the inclusion of all benefits but also the potential that some benefit types whose absolute value may be small could affect the incremental benefit-cost ratio and the choice between different standards of protection. This is the case for the willingness to pay values associated with the avoidance of stress and anxiety associated with flooding (RPA/FHRC 2004). It is important, however, that the time (and effort) spent on monetising benefits is proportionate to the potential significance of the impact and the decision being made. This links back to the need for an initial screening of impacts as to whether they are likely to be significant to the decision being made (or not). If not, the AST can be used to record reasons why the impact has not been considered further. If data become available that show that the impact may be greater than was first envisioned, it can then be included in the appraisal.

There are also likely to be issues in terms of the additional time that may be required to complete the ASTs. Although this should, in theory, provide a consistent way of recording what is already undertaken in project appraisal, the review of PARs showed that very few reports indicated that benefits other than property damages had been assessed. Therefore, there may be additional time and data requirements associated with collecting information on other benefit areas. This is one of the factors being assessed in the MCA pilot tests, which are due to report on additional time, data and resources required, and where completion of ASTs is an important first step in the approach. Two of the guidance documents used in other fields highlight the difficulty of quantifying all of the benefits. To overcome this, a total of 12 guidance documents propose the use of scoring and weighting techniques as a way of including non-monetary benefits into the appraisal process.

The issue of additional time requirements could also be addressed by providing guidance on different approaches that could be used at different points in the appraisal process. This could include overview assessments, based mainly on qualitative data and/or using the simple or simplified approaches from the MCM (and Handbook). For example, property damages could be estimated by using Table 4.17 in the MCM (Table 4.4. of the Handbook), which provides details of typical Average Annual Damages of £6,027 per property per year (no protection, no warning). Thus a very quick estimate of property damages for do-nothing could be obtained by multiplying £6,027 by the number of properties within the floodplain. AAD for an option providing a 1 in 50 standard of protection decreases to £303 per property per year. Thus, the damages avoided of the 1 in 50 option are £5,724 per property per year (£6,027 - £303).

**Table 8.3 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
Lack of coordinated guidance on the type of impacts that could occur and how to assess them	Need for coordinated consistent approach that encourages a comprehensive look at the impacts that could occur at an overview level	Use of Appraisal Summary Tables (ASTs) that include a comprehensive list of impact categories (e.g. drawing on the categories used in the EIA)	Easy – ASTs are being used in many fields, with possible ASTs provided in the MCA study (FD2013) and the Sugden approach project
Perception that other benefits only need to be assessed if ‘traditional’ property damages are insufficient to justify the scheme	Links to above and need to start out by considering all of the impacts that could occur, first qualitatively then quantitatively and finally in money terms, as necessary/appropriate	ASTs again would provide a good basis for ensuring consideration of all impact types from the outset	Easy – ASTs already developed for MCA and Sugden approach
Complicated and detailed approach to estimating benefits, e.g. agriculture	There is a lot of inconsistency between the level of detail required in the various approaches to estimating different benefit types. The MCM tends to suggest detailed methods from the outset (including for agriculture) and it is likely to be necessary to consider short-cut methods (e.g. greater use of Table 4.17 from MCM/Handbook which could reduce need for modelling, identification of individual properties at risk, etc.)	Links to providing guidance at different levels (see also Section 3), with potential to use overview/quick methods at first and obtaining more detail where uncertainty is such that choices cannot be made between options	Easy to moderate – basic datasets for many of the benefit types are already developed. Simple approaches to estimating benefits could be developed/emphasised at an overview level, moving to more detailed approach, e.g. as in MCM

**Table 8.3 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
Lack of reporting in PAR on adjustments made	It is unclear from the PARs whether certain adjustments have been made to the benefits. Key factors in estimating benefits such as adjustments should be reported to show that the appraisal has been undertaken correctly. This could be addressed by modifying the PAR to include checklists where ticks, etc. can be given to show that certain actions have been undertaken. Alternatively, use of an AST could encourage such reporting	Use of checklist/tables in PAR and/or ASTs to encourage reporting of key aspects of benefits assessment	Easy – linked to ASTs or setting out tables highlighting key issues such as discount rate, time horizon, subsidies removed, etc. (all of which are not always currently reported in the PARs)
Perception that benefits are small and so will have little effect on the selection of the preferred option	Need to move away from adding benefits until the project is justified to considering what impacts may occur then focusing in on the most significant ones. This is a much more transparent and auditable approach, and encourages consistency between different appraisals	Use of AST to start from is there an impact – if yes, is it likely to be significant and why, then to further description and monetisation (as appropriate)	Easy to moderate – ASTs are already developed. Will need supporting guidance and examples and change in attitude
Perception that costs can be predicted more accurately and that decision is mainly based on costs	Indicates that there is uncertainty about the level of detail required, both for costs and benefits. There is inconsistency which should not be happening. Benefits should have a similar amount of time spent on them as they are as important when making a decision	Need for greater guidance on the level of detail that is appropriate (See also Section 4.2)	Linked to requirements of Section 4.2

**Table 8.3 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
<p>Perception that use of MCM will generate large benefits reasonably quickly. Providing more detailed benefit estimates will require a significant amount of additional time and the additional benefits will be small</p>	<p>Again highlights that the current approach starts from the wrong place. Need to start by scoping what the benefits may be and then focus in, not start from property damages and then scope out if needed</p>	<p>Use of AST to change focus of benefits assessment</p>	<p>Easy to moderate – ASTs already developed but may be perception that completing it will take a lot of time. Therefore, needs to be linked to better guidance on the level of detail that is appropriate</p>
<p>Perception that do-nothing option can be manipulated to increase the damages as required to improve the justification of a scheme</p>	<p>Requirement for structured, transparent approach to project appraisal, but there will always be scope for manipulation of the results. Key is in making sure that the results 'feel right', which needs an experienced project manager or approver to test (see also Section 5)</p>	<p>Requirement for structured, transparent approach with key decision-making stages  Need for intelligent client</p>	<p>Moderate to difficult – transparent approach means every decision can be justified. Approvers need to have a feel for what is an appropriate solution, which depends as much on reporting of the problem, etc. as the approvers experience</p>

### **8.3 Is adequate consideration given to impacts that cannot be valued in monetary terms?**

#### **What is the problem?**

The review of Project Appraisal Reports (PARs) has shown that 72% (48 out of 67 reviewed) considered environmental and/or social impacts to some degree. However, only 16 of these (25% of those including environmental and/or social benefits and 24% of all PARs) took the environmental and social impacts into account when selecting the preferred option. Two of the 16 PARs used scoring and weighting techniques, two used surrogate values to convert the environmental and social benefits to money values, while one added 50% to the tangible benefits to represent the potential value of

intangibles. A further eleven PARs used descriptions of environmental impacts (mainly) to assist with option screening.

The reasons for not including intangible benefits included that the benefit-cost ratio was sufficiently robust based on tangible benefits only and that environmental and social benefits were ‘small’.

Therefore, while the majority of PARs included the results of the Strategic Environmental Assessment (or similar), only 17 (out of 49, 35%) took account of the findings in the appraisal.

In summary, the problem is that impacts that cannot be valued in monetary terms are often being completely ignored or overlooked. Even where an SEA/EIA has been undertaken, it is rare for the results to feed into the appraisal. This is causing a lack of consistency where for each PAR including the results of the SEA/EIA, two do not consider them at all in the appraisal. Similarly, for each appraisal that includes intangibles in the selection of the preferred option, there are six appraisals that do not. This also raises an issue in terms of prioritisation and comparison between the results of economic appraisals, although presumably, the required priority score has been attained such that further benefits have not been sought.

Table 8.4 summarises the problems related to inclusion (or non-inclusion) of those impacts that cannot be valued in monetary terms. The significance of each problem is also indicated in terms of how it affects the approach being used and its influence on the outcome of the appraisal. The table draws in evidence from consultation and the review of Project Appraisal Reports and the existing set of FCERM guidance.

**Table 8.4 What is the problem?**

Problem	Significance in terms of ...	
	Approach used	Appraisal outcome
Environmental and social issues are not being included	High	High (but will depend on project)
Issues not scoped wide enough	High	High
Goalposts are unclear	Low	High
PAGs are too flexible	High	Medium
Most sustainable option is not being selected as the preferred option	Medium	High
Project appraisal is being undertaken in isolation from land use management and strategic environmental assessment	High	High
Risk that approvals including non-monetised benefits will not be accepted at the approval stage	Low	High
Appraisals are not being used to learn	High	Medium

Table 8.4 shows that many of the most significant problems stem from the approach that is being used, and that this may be having a significant influence on the outcome of the appraisal, thus, may be affecting if the 'best' option is being selected. The next step is to identify the causes of the problem, in order to determine if the problem can be solved by changes to the guidance or requires other changes to be made.

### What are the causes of the problem?

Table 8.5 sets out the cause of each problem identified in Table 8.4 as having an effect on whether impacts that cannot be valued in money terms are included or not. This draws on evidence from consultation, in particular the workshops. The table provides an indication of the extent that each cause is driving the problem.

**Table 8.5 What are the causes of the problem?**

<b>Problem</b>	<b>Causing problem</b>	<b>Influence on problem</b>
Environmental and social issues are not being included	Current guidance (PAG5) is too general – it is rudimentary at present and is perceived as a bolt-on – it is not clear how to use the guidance on environmental issues in decision-making	Medium
	Vagueness about environmental and social issues – the issues identified in the guidance may not be the most relevant – there is an EA/Government policy vacuum on social issues and a lack of emphasis on social and environmental issues in the guidance	High
	Environmental assessment is difficult to integrate into the decision-making process – for social issues there is an even less robust process	Medium
Environmental and social issues are not being included (continued)	No apparent units of measurement – everything is measured in different units – therefore difficult to compare environmental and social impacts with economic impacts – social impacts even more difficult than environmental impacts to measure	High
Issues not scoped wide enough	Difficulty of measuring, e.g. social cohesion – what is the impact in one village, but also what is the wider impact on other villages	High
	Potential for flood defence project to ask as a prime for other projects, e.g. regeneration (not allowed to include at present)	Low
	Social impacts are not considered at all in the guidance documents	High

**Table 8.5 What are the causes of the problem?**

<b>Problem</b>	<b>Causing problem</b>	<b>Influence on problem</b>
Goalposts are unclear	No guidance on how important environmental and social issues may be now in terms of decision-making (what about in the future?)	Medium
PAGs are too flexible	Could be interpreted as a get-out clause (not having to include environmental and social impacts)	Low
	Perception of additional effort required to include environmental and social issues – organisational inertia – only considered if there are insufficient benefits from property damage	High
	Perception that environmental and social impacts are ‘small’	Low
Most sustainable option is not being selected as the preferred option	Traditional conservative views and historical practice – but also the perception of consultees – they like to see a defence, therefore, care is needed when promoting schemes such as washlands	High
	PAG not does encourage consideration of non-structural solutions, and we tend towards capital and structural solutions – separation of capital and maintenance funding does not help	Medium
Project appraisal is being undertaken in isolation from land use management	Involvement of planners limited	Medium
	Not looking far enough forward – emphasis tends to be on next 10 years	Low
	Guidance is not based on sustainability criteria – guidance was written before sustainability became an accepted issue	Medium
Risk that approvals including non-monetised benefits will not be accepted at the approval stage	NRG is a constraint – people are not willing to put forward higher cost schemes because they do not want their schemes to be turned down – non-monetised issues may not be presented well, plus lack of confidence in presenting a fully transparent business case	High
	Potential for ‘different’ solutions to result in public enquiries, etc. – so people prefer to stick to tried and tested	Medium
Risk that approvals including non-monetised benefits will not be accepted at the approval stage (continued)	Professionals are not being allowed to exercise their judgement – what is given as ‘might’ in the guidance is interpreted as ‘must’ at the approval stage	High
Appraisals are not being used to learn	Options such as relocating communities, flood warning and resilience are not being considered	Medium

**Table 8.5 What are the causes of the problem?**

Problem	Causing problem	Influence on problem
	Political factors and vociferousness of communities can result in certain areas having greater clout with decision-making than equally deserving but less informed communities	Medium

Table 8.5 shows that the main problems in terms of inclusion of impacts that cannot be easily valued is linked to a lack of current guidance on what types of impacts should be considered and how to include them. This is compounded by a lack of available measurements for many of the impacts (particularly social) that has given many the perception that a lot of additional effort is required to take non-monetised impacts into account in the appraisal. There are also stakeholder and approver perceptions of what should happen that are reducing the extent to which professional opinion and experience can be used within appraisals.

The next step is to consider what solutions are required to tackle the causes of the problems.

### **What are the solutions?**

Table 8.6 sets out potential solutions for each cause and each problem. Some of the causes require more than one solution, or have alternative solutions. For each solution, action that can be taken is described with the ease of implementation also given (ranging from easy to difficult). Where possible, the solutions are linked to existing process or appraisals. Evidence of the solutions is drawn from consultation, and from the review of guidance documents and appraisal processes used in other fields. The review of PARs is also used where one (or more) PARs have included impacts that could not be easily valued, as these suggest that approaches are already available that could reduce or remove the problems.

Table 8.6 shows that there are possible solutions to all of the causes of the problems. Many of these solutions require other actions to be put into place such that the changes will take time. However, attitude changes (which are often highlighted as difficult in Table 8.6) may begin to change as some of the 'easy' solutions are implemented, such that taking the easy steps may reduce the hurdles facing the other solutions. There are three 'easy' solutions identified in the table. They are ranked as easy as part (or all) of the process is already developed; it just needs to be rolled out:

- use of Appraisal Summary Tables providing a comprehensive set of impacts to be at least considered in each appraisal. This would ensure consistency between appraisals as well as encouraging early consideration of a much wider range of impacts. Most PARs reviewed under Task B1 included a summary of the results of the EIA/SEA.

Inclusion of an AST would help bring the results of the EIA/SEA into the appraisal. ASTs are also widely used in other appraisal processes (particularly transport). Other FCERM projects, including the MCA project and the Sugden approach are using ASTs and, hence, would provide ready-made templates that could be brought into project appraisal without the need for considerable additional work or research.

- inclusion of impacts in an AST would encourage their consideration when selecting the preferred option. Worked examples showing how this has been done in other PARs may be needed to give appraisers the confidence to argue for a different option than is suggested by economic indicators alone. This will also require briefing of the approvers to avoid rejection of PARs that look beyond the incremental benefit-cost ratio. It is important that the AST is used as a method of recording information on impacts and assumptions (including where impacts are not considered significant and so have not been assessed in detail) and that this is complementary to the estimation of monetary costs and benefits.
- loss of life benefits could be easily included in project appraisals making use of Defra research on 'risks to people' and Department of Transport guidance on the value of a life and damages from accidents. This would require a supplementary note explaining how to include such benefits. This supplementary note could combine the inclusion of an AST (or other structured approach) such that all of the 'easy' solutions could be implemented at once (thus avoiding updating problems).

**Table 8.6 What are the solutions and how can they be implemented?**

<b>Causing problem</b>	<b>Solutions</b>	<b>Ease of implementation of solution</b>	
Current guidance (PAG5) is too general – it is rudimentary at present and is perceived as a bolt-on – it is not clear how to use the guidance on environmental issues in decision-making	Need more formal scooping method to identify if there are environmental and social issues – series of tables to identify if there are impacts early on with no need to carry on if not	Promote use of Appraisal Summary Tables through link to MCA guidance or similar to approach used in Carlisle PAR	Easy – process already in place
	Need transparent use of balance sheet’ – like Appraisal Summary Table, so that not all attributes are costed but can still be taken account of in decision-making – those that are not monetised are then not ‘lost’ in the overall estimate of benefits – need better links between SEA and appraisal (e.g. MCA)	AST from MCA is based on SEA categories, therefore, should help improve links between SEA and appraisal, as is done in Tyne CFMP	Easy – process already in place BUT will also require change in attitude (see below)
	Supplementary guidance is needed on social issues	Requires links to be forged with EA social scientists	Moderate – links not readily made – but being looked at under Barriers project
	Training is required on how to include non-monetised benefits	Will require change in process to be implemented	Moderate (long-term) – requires other changes to be made first
Vagueness about environmental and social issues – the issues identified in the guidance may not be the most relevant – there is an EA/Government policy vacuum on social issues and a lack of emphasis on social and environmental issues in the guidance	Clarification on how to measure – qualitative and quantitative – what information should decision be based on (but is that information available?)	Will require research to develop ‘new’ measures, but no reason why qualitative impacts cannot be included	Moderate – will require move to AST BUT will require more flexible approach to decision-making
	Need better balance between environmental and social issues, and economic impacts	Needs change to decision-making and prioritisation	Moderate – EA reviewing prioritisation
	Need inclusion of loss of life benefits	Approach already developed	Easy – need to implement risks to people
	Need to move to objective-led approach – but how to compare different objectives?	Much of options appraisal is moving in this direction, such as has been used in appraisal process for climate change and water resources	Difficult – will take time to develop new approach that is acceptable and not too time consuming

**Table 8.6 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
Environmental assessment is difficult to integrate into the decision-making process – for social issues there is an even less robust process	If truly looking at MSfW need to take future developments into account – can be included in transport appraisals	Will require change of policy from Defra, and could be linked to scenario analysis	Difficult
No apparent units of measurement – everything is measured in different units – therefore difficult to compare environmental and social impacts with economic impacts – social impacts even more difficult than environmental impacts to measure	Need clarification and may require research to develop new ways of measuring the impacts (some may never be measurable) – need guidance on how to take account of social issues even if they cannot be easily measured	Requires links to be forged with EA social scientists and research	Moderate – links with social scientists not readily made – but being looked at under Barriers project
Difficulty of measuring, e.g. social cohesion – what is the impact in one village, but also what is the wider impact on other villages	Need to take account of environmental and social issues when spending money on environmental enhancement	Requires method of highlighting benefits of enhancements – linked to objective-led and prioritisation. Flexbury PAR takes account of environmental enhancements when selecting the preferred option	Moderate to difficult (see above)
	Change in attitude – could be assisted by good guidance and process – may also require in change in approach to prioritisation to encourage inclusion of benefits that cannot be monetised	Will require new guidance (may be new approach to appraisal), training, etc.	Moderate (long-term) – relies on a lot of other changes to be made first
Potential for flood defence project to ask as a prime for other projects, e.g. regeneration (not allowed to include at present)	Necessary to consult in a meaningful way – education and selling of benefits of sustainable solutions	Requires lessons to be learnt from other projects, training, clear communications – may be easier to sell to professional community (e.g. guidance on change in approach to managing pools and ponds)	Moderate – may take time to educate people and change views

**Table 8.6 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
	Guidance needs to promote non-structural schemes, whole life costs, etc. – but likely to also require change in attitude	Needs change of emphasis in guidance	Moderate – change in guidance ; change in attitude will be long-term
	Grant-in-Aid could help overcome some of the reluctance to follow non-structural routes	Already underway – impact needs to be monitored	Already in place
Social impacts are not considered at all in the guidance documents	Need for planners to ‘own’ the problem, need to get planners involved in appraisal – need to be able to take planners views into account (where these may be very different from traditional viewpoints) – but partnering can be difficult and risky – requires action plans	Requires change in approach, time required for planners to become involved and potentially development of cross-sectoral guidance	Difficult – any changes would have to be co-ordinated with planners
No guidance on how important environmental and social issues may be now in terms of decision-making (what about in the future?)	Need to change perception that inclusion of intangible benefits takes a lot of effort and has only a limited effect on the outcome of the appraisal – plus chance that the appraisal will be rejected at the approval stage	Needs worked examples of PARs that have taken ‘intangibles’ into account and preferred option has changed	Moderate – easy to identify examples but need to convince users of the benefits – change in attitude
	Need guidance on what to include, when and how to same level as is currently done for tangible impacts	Needs specific guidance, linking to what is already available –may be more in terms of how to describe and measure such impacts rather than trying to find ways to monetise the impacts	Moderate – other appraisal processes and guidance suggest the use of ASTs to scope impacts and record qualitative descriptions
Could be interpreted as a get-out clause (not having to include environmental and social impacts)	Needs to be consistency in definitions – e.g. in defining ‘community value’	Need for specific guidance setting out definitions	Moderate to difficult – need to have agreed definitions, but can draw on definitions used elsewhere (e.g. SEA/EIA)

**Table 8.6 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
	Guidance needs to give equal weighting to economic, environmental and social impacts (e.g. MCM focuses on economic impacts)	Need guidance on environmental and social issues showing how they can be assessed and how they can be taken into account in decision-making	Moderate – need to provide formal ways of including these impacts in guidance with examples
Perception of additional effort required to include environmental and social issues – organisational inertia – only considered if there are insufficient benefits from property damage	Need to go back to objectives of MSfW – start new guidance from top down, reducing the need to redo work that will have been undertaken at a higher level	Requires complete reworking of guidance	Moderate – in combination with other issues, complete reworking is required
	Approvers need to know the guidance – NRG need to more flexible and take a more pragmatic approach	Requires approvers to be familiar with guidance, be trained, etc.	Moderate – likely to be a time constraint
	Requires support and explanation for decision-makers to be able to take 'different' solutions forward – give confidence (helped by move from flood defence to flood risk management – but needs further encouragement for risk-based approaches)	Needs change of emphasis in guidance and from approvers, supported by worked examples showing that it can be done	Moderate – may require time, not just in terms of appraisal but in showing that 'different' solution work – perhaps using trials
Perception that environmental and social impacts are 'small'	Change in emphasis of social and environmental impacts compared with economic impacts may help to reduce this issue	Needs change of emphasis to encourage change in attitude, also likely to require training and worked examples showing where this is not the case	Moderate (long-term) – requires other changes to be put in place first, plus dissemination of examples as part of new guidance
Traditional conservative views and historical practice – but also the perception of consultees – they like to see a defence, therefore, care is needed when promoting schemes such as washlands	Looking towards using scenario analysis – drives you towards looking at portfolios of options (but powers do not exist to implement some of these options)	Requires change in approach – may be resisted by some, education and training	Difficult (long-term) – need to address potential resistance, but should be supported by other changes/solutions being put in place

**Table 8.6 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
PAG not does encourage consideration of non-structural solutions, and there is a tendency towards capital and structural solutions – separation of capital and maintenance funding does not help	Need more equitable comparability criteria between communities and a transparent system  Prioritisation needs to mimic the appraisal – prioritisation and appraisal needs to be lined up correctly – should not be just based on economics	Need changes of emphasis and revised approach to prioritisation	Moderate – ASTs may help in move towards this
Involvement of planners limited	Need for planners to become more involved	Requires time required for planners to become involved	Difficult – any changes would have to be co-ordinated with planners
Not looking far enough forward – emphasis tends to be on next 10 years	For sustainability, need to be looking further into the future	Need changes of emphasis, perhaps through scenario analysis	Difficult – likely to require lots of other changes (e.g. see below)
Guidance is not based on sustainability criteria – guidance was written before sustainability became an accepted issue	Need to begin from sustainability criteria, potentially using objective-led approach	Much of options appraisal is moving in this direction	Moderate – will take time to develop new approach that is acceptable and not too time consuming but can draw on changes being made elsewhere (e.g. SMP/CFMP)
NRG is a constraint – people are not willing to put forward higher cost schemes because they do not want their schemes to be turned down – non-monetised issues may not be presented well, plus lack of confidence in presenting a fully transparent business case	Need to move away from ‘checklist’ type approach BUT also requires PARs to be very clearly set out, logical and easy to read	Requires approvers to be familiar with guidance, be trained, etc. and better/clearer PARs	Moderate – need to have clear lines of communication

**Table 8.6 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
Potential for 'different' solutions to result in public enquiries, etc. – so people prefer to stick to tried and tested	Need to educate stakeholders and those undertaking appraisals both in terms of the appraisal process and outcomes. Also requires appraisal process that is transparent and takes wider issues (social) into account and apply a learning process so everyone can see how and why a decision has been reached	Requires change to appraisal process as well as guidance and better communications	Difficult and long-term – linked to all other changes given here
Professionals are not being allowed to exercise their judgement – what is given as 'might' in the guidance is interpreted as 'must' at the approval stage	Need to move away from 'checklist' type approach by approvers	Requires change in attitude – more flexibility	Moderate – due to accountability
Options such as relocating communities, flood warning and resilience are not being considered	No methods for implementation of these options – new approaches need to be identified and made available for implementation	Linked to toolkits project	Moderate – research required
Political factors and vociferousness of communities can result in certain areas having greater clout with decision-making than equally deserving but less informed communities	Always likely to be an issue – require completely transparent appraisal process that is perceived as being fair to minimise potential for interference	Needs revised appraisal process and guidance	Difficult and long-term – linked to all other changes given here

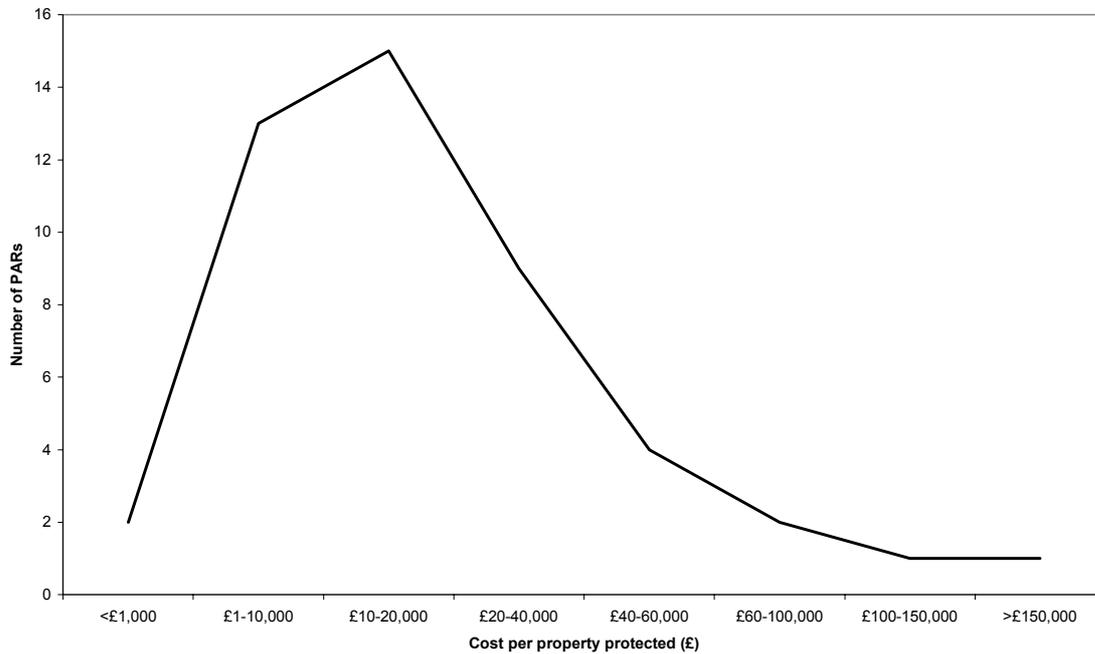
## 8.4 Are values of costs and benefits broadly consistent across different appraisals, scales, locations and timescales?

### What is the problem?

The costs and benefits per property protected have been estimated for those PARs where information on the number of properties, preferred option, and costs and benefits of the preferred option were readily available (47).

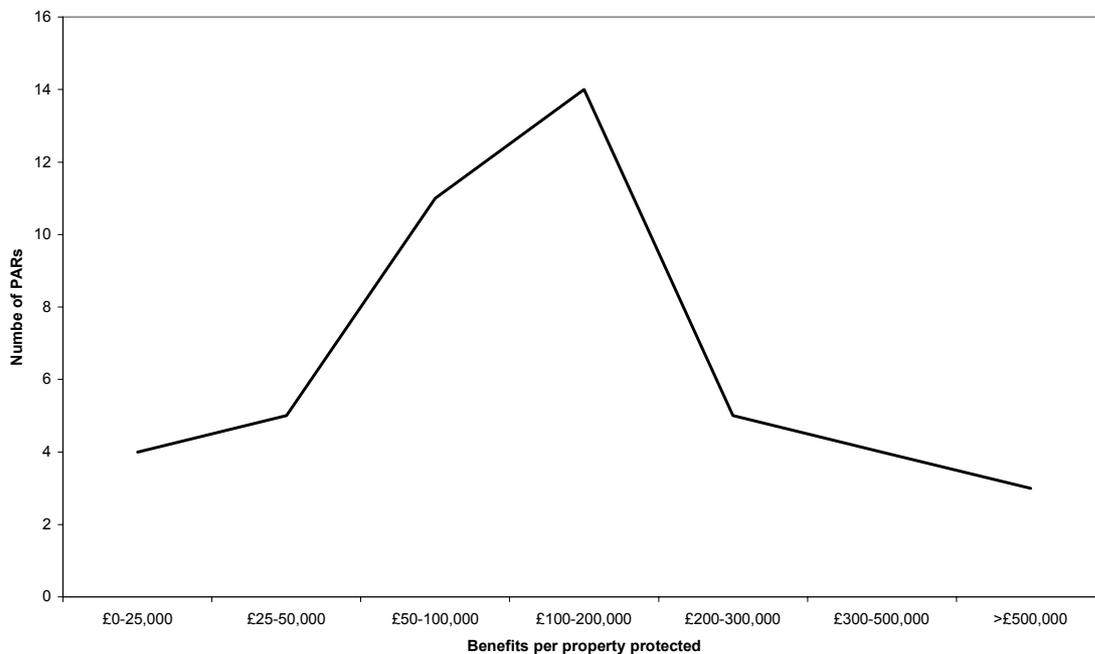
Costs vary between £700 and £190,000 per property protected, with a mean value of almost £27,000 (median: £16,000). Most of the estimates of cost per

property protected fall between £3,000 and £20,000 (28), giving a distribution as shown in Figure 8.1 with positive skew.



**Figure 8.1 Distribution of costs per property protected**

Benefits per property protected are more variable than the costs, ranging from £13,000 to £570,000, with a mean of £160,000 (median: £120,000). Again the distribution has positive skew, as shown in Figure 8.2.



**Figure 8.2 Distribution of benefits per property protected**

The above discussion shows that there is very little consistency in the values of costs and benefits per property protected. However, there are many factors that could be affecting the consistency of the figures:

- costs:
  - the standard being provided;
  - rural versus urban areas;
  - the type of works to be undertaken;
  - capital versus maintenance works; and
  - new construction versus refurbishment of existing defences/assets.
- benefits:
  - inclusion of other benefits than just property damages;
  - write-off of properties versus depth-damage;
  - capping;
  - flood depth; and
  - timing of flooding (as a result of discounting).

The costs and benefits per property by standard being provided has been estimated based on the 47 PARs for which information was readily available. The mean, median, minimum and maximum are given for three different standards of protection in Table 8.7.

**Table 8.7 Costs and benefits per property protected by standard of protection**

<b>COSTS</b>	<b>Standard of protection<sup>1</sup></b>		
	<b>&lt;100</b>	<b>100-200</b>	<b>&gt;200</b>
Number of PARs	9	14	22
Mean	£25,000	£15,000	£29,000
Median	£20,000	£13,000	£16,000
Minimum	£750	£700	£4,200
Maximum	£98,000	£58,000	£190,000
<b>BENEFITS</b>	<b>&lt;100</b>	<b>100-200</b>	<b>&gt;200</b>
Number of PARs	11	14	21
Mean	£160,000	£87,000	£190,000
Median	£120,000	£61,000	£150,000
Minimum	£34,000	£13,000	£64,000
Maximum	£460,000	£260,000	£570,000

Notes: <sup>1</sup> These standards of protection were selected to reflect the varying standards provided in the PARs and to ensure that sample sizes were sufficient to provide meaningful statistics

Table 8.7 shows that there is no obvious pattern in terms of costs per standard, although this is likely to be reflecting the minimum and maximum values for each category as much as the variation between the standards. However, for the categories of “<100” and “>200”, there is more than one value close to the maximum value. This means that ignoring the maximum and minimum values makes very little difference to the pattern shown in Table 8.7 (i.e. costs are greater for <100 and >200 than for 100-200).

The two PARs with the greatest costs (both £100,000 per property protected) are rural areas, while those with the lowest costs (of around £700 per property

protected) are urban areas (or include large numbers of properties). This is perhaps to be expected since a long length of defence protecting a few isolated properties will have a higher cost per property protected than a short length of defence protecting a large number of densely packed properties. However, the range of works proposed under the preferred options varies widely making it difficult to identify an appropriate length of defences in all cases. There is also a tendency within the PARs to allocate most areas to Land Use Band A or B, often with little explanation why a particular land use band is used.

In terms of benefits per property protected, two of the PARs with the lowest benefits per property protected (£13,000 and £15,000) included only property damages and undertook capping. It is not possible to determine what effect capping has had on the benefits as uncapped damages are not given (neither are the capping values).

There are a number of problems with the way the results of the appraisal are currently presented. Firstly, it is difficult (and time consuming) to extract information from the PARs, even where the PAR template has been used, the same type of information is often included in very different sections. A lot of basic information is missing. This includes the number of properties protected, the length of defences being provided and description of the type of benefits that have been assessed. It is, therefore very difficult to draw any meaningful conclusions on the extent to which there is consistency in costs and benefits, other than to say it appears that they are not consistent.

Table 8.8 summarises the problems related to consistency of costs and benefits. The significance of each problem is also indicated in terms of how it affects the approach being used and its influence on the outcome of the appraisal, based mainly on the review of Project Appraisal Reports.

**Table 8.8 What is the problem?**

Problem	Significance in terms of ...	
	Approach used	Appraisal outcome
Costs and benefits given in PARs are not supported by basic information making it difficult to identify why costs and benefits may not be consistent	Medium	High

The next step is to identify the causes of the problem, in order to determine if the problem can be solved by changes to the guidance or requires other changes to be made.

**What are the causes of the problem?**

Table 8.9 sets out the cause of each problem identified in Table 8.8 as having an effect on whether impacts that cannot be valued in money terms are included or not. This draws on evidence from consultation, and in particular the review of PARs used as the basis for assessing the consistency of costs and benefits. The table provides an indication of the extent that each cause is driving the problem.

**Table 8.9 What are the causes of the problem?**

<b>Problem</b>	<b>Causing problem</b>	<b>Influence on problem</b>
Costs and benefits given in PARs are not supported by basic information making it difficult to identify why costs and benefits may not be consistent	Lack of consistency in terms of the types of benefits that are being considered and assessed	High
	Focus on the engineering aspects of appraisal, with much less description of non-engineering aspects such as benefits	Medium
	Little description or detail on why certain choices have been made (e.g. Land Use Band) such that the PAR (and appraisal itself) loses transparency	Medium

Table 8.9 shows that some of the problems in terms of identifying consistency of costs and benefits are due to reporting (both in the PAR and supporting appendices), attitudes (where there are pages of details on engineering concepts but only paragraphs on non-engineering concepts), and the lack of a consistent approach. It is, therefore, perhaps not surprising that there is an apparent lack of consistency in the costs and benefits.

Concerns have also been raised at the workshops that not all of the benefits can be taken into consideration at present. This includes the potential for regeneration benefits which cannot currently be captured, but also the amenity and community benefits that may occur as knock-on rather than direct benefits of a project.

The next step is to consider what solutions are required to tackle the causes of the problems.

### **What are the solutions?**

Table 8.10 sets out potential solutions for each cause and each problem. Some of the causes require more than one solution, or have alternative solutions. For each solution, action that can be taken is described with the ease of implementation also given (ranging from easy to difficult). Where possible, the solutions are linked to existing process or appraisals. Evidence of the solutions is drawn from consultation, and from the review of guidance documents and appraisal processes used in other fields. The review of PARs is also used where one (or more) PARs have included impacts that could not be easily valued, as these suggest that approaches are already available that could reduce or remove the problems.

Table 8.10 shows that there are possible solutions to all of the causes of the problems and that these could link to the solutions described in Sections 8.2 and 8.3, particularly in terms of the use of ASTs. There is also a need to build confidence and cooperation between appraisers and approvers. Comments at the workshops showed there to be a barrier between these groups, with approvers seen as one of the major problems in terms of their requiring ever greater detail. This needs to be addressed to encourage appraisers not to

include something which may be insignificant just so it is covered in the PAR, but to take full account of all important aspects while undertaking the appraisal. This is likely to require greater links between appraisers and approvers, for example through feedback. It will also be beneficial to offer training on the use of ASTs (and any new guidance) to both appraisers and approvers.

**Table 8.10 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
Lack of consistency in terms of the types of benefits that are being considered and assessed	Need to begin by considering a wide range of impacts that could occur and focusing on those that are likely to be significant	Use of ASTs, as discussed in Sections 8.2 and 8.3	Easy – ASTs have already been developed, but it may be more difficult changing attitudes on how to assess benefits
Focus on the engineering aspects of appraisal, with much less description of non-engineering aspects such as benefits	Need to emphasise that the benefits have an equal influence on selection of the preferred option as the costs	Use of ASTs may help refocus efforts to some degree	Easy to moderate – use of ASTs should be easy but there may be additional time requirements
Little description or detail on why certain choices have been made (e.g. Land Use Band) such that the appraisal as set out in the PAR (and appraisal itself) becomes less transparent	Need to encourage full transparency in the appraisal. There is a need to generate confidence between appraisers and approvers. Increasing flexibility for appraisers may help improve transparency as it will become increasingly important to justify decisions	Need for greater links and feedback between appraisers and approvers, including training of both on any new guidance	Moderate to difficult – need to provide appraisers with flexibility to produce good appraisals and approvers to use their process as a way of providing feedback, rather than approve/not approve

## 8.5 Overall solutions

There is a need to improve consistency in the way that benefits are considered, both in terms of identifying whether a particular impact is likely to occur and to cover all of the economic, environmental and social issues. This is likely to be most easily and transparently addressed through the use of ASTs. The AST can be used as a checklist to make sure that all relevant impacts have been identified and considered, at least in qualitative terms, and to record why impacts determined as not significant have not been assessed in detail. The AST can also be used to record assumptions made when quantifying in money

terms those impacts for which monetary estimation is considered appropriate. Care is needed that this is not perceived to be adding to the time and data requirements for an appraisal (otherwise there is a risk that the ASTs will not be used as an integral part of the appraisal process to inform decision-making). The use of ASTs will need to be accompanied by guidance explaining:

- how the categories have been identified: this may be best done by making use of existing ASTs such as those prepared for the MCA or Sugden projects, which incorporate categories from Environmental Impact Assessment/Strategic Environmental Assessment;
- what each category covers: which issues are included where. This is essential to avoid different interpretations of the categories and to prevent double counting of impacts;
- potential use of the AST as a method showing which impacts are considered relevant to the decision (and have therefore been assessed to detail) and reasons why other benefits are not considered significant (and have been screened out); and
- providing indications of how each impact could be measured, including where it may only be possible to describe potential impacts in words. The guidance could include details of types of information that could be considered, including indicators that could be used to quantify the impacts, plus references to appropriate willingness to pay values that may be applicable (to allow impacts to be expressed in money terms). To make sure that the full range of benefits included in the AST (qualitative, quantitative and monetary) are included when selecting the preferred option (and thus make the additional effort of assessing all of the potential benefits worthwhile), it is likely that changes will need to be made to the decision rule (see Section 11).



## 9. Sensitivity analysis

### 9.1 What does the current guidance say?

There is no mention of sensitivity in FCDPAG1.

There is a general description of sensitivity analysis in FCDPAG2, which links it with risk analysis (S3.4.5) and states that it plays a significant role in option appraisal.

A more detailed explanation for sensitivity analysis and robustness testing can be found in FCDPAG3 with guidance on why and how to undertake sensitivity analysis (S6.4).

The explanation of how sensitivity testing is used to demonstrate robustness of choice of the preferred option is described in FCDPAG4 (S3.3.4) and how it may determine if more detailed methods are required.

FCDPAG5 makes no mention of sensitivity analysis.

The use of scenarios is discussed in CFMP Guidance (Vol 2, Ch 7). However, the guidance on climate change is confusing and that on development is difficult to implement due to lack of data (and is possibly incorrect). The concept that 'the past is a guide to the future development' is questionable. The use of MDSF is suggested (however some practitioners have found other methods more useful).

In the SMP Guidance, Vol 2 identifies sensitivity testing as a task in choosing the preferred scenario (S3.4): *'For the preferred scenario it is recommended that the following activities are undertaken to confirm its viability and sensitivity to changes to the assumptions made'*.

- (a) *Sensitivity testing: Identify uncertainty in key variables and potential impacts on preferred policy scenario.*
- (b) *Socio-economic assessment: consider costs/benefits also cumulative human and natural implications for preferred policy scenario.*

The importance of sensitivity analysis as a '*crucial step*' is discussed in the MCM (S2.4) and the MCH (S2) and both state that: *'it should be undertaken at the start of the appraisal process not at the end as is commonly recommended'*. Robustness analysis is described as: *'a series of tests to determine whether, given the inherent uncertainties, it is possible to be confident as to which option is preferred.'* (S2.4 MCM). There is also discussion on how to use sensitivity and robustness analysis in decision making by testing how far critical parameters have to change to change the rank order (switching values).

Sensitivity analysis is covered in the Project Appraisal Report Guidance in relation to the preferred option only (S2.7):

- *‘Check sensitivity of this choice against variations in costs and benefits. This needs to demonstrate that the correct option has been chosen and what change in costs/benefits would change the option.*
- *Check sensitivity of this choice against climate change. Any change in the preferred option due to climate change should be clearly explained’.*

There is no information on how this should be undertaken (other than general pointers to the FCDPAG series).

## **9.2 How much influence do the allowances and sensitivity tests have on the choice of solutions and how can sensitivity analysis be improved?**

### **What is the problem?**

A total of 50 of the 67 PARs reviewed undertook some kind of sensitivity analysis, but 17 did not undertake any sensitivity analysis at all. Of these 50 PARs, 26 reported changes to the costs, with a further six making changes to optimism bias. Only 16 PARs reported making changes to the benefits in the sensitivity analysis.

The most common approach to sensitivity analysis is to apply a factor to the costs and/or benefits (for example, an increase/decrease of 20%). There is generally no discussion on why 20% (or any other figure) has been used, suggesting that uncertainty within the cost and benefit estimates is not known or not investigated. For example, use of Excel functions to automatically read a value from the depth-damage data in the MCM/Handbook can introduce errors of up to 30% if interpolation is not used<sup>2</sup>. The depth-damage figures themselves are also uncertain, but an indication of the uncertainty is not given in the MCM or Handbook. Behind this are uncertainties associated with modelling, thresholds, etc., such that overall uncertainty within the benefits could be as much as 100%. A change of 20% in the benefits is, therefore, unlikely to fully address the uncertainty within the benefit estimates.

Table 9.1 summarises the problems related to allowances and sensitivity tests. The significance of each problem is also indicated in terms of how it affects the approach being used and its influence on the outcome of the appraisal. The table draws in evidence from consultation, the review of Project Appraisal Reports and the existing set of FCERM guidance.

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<sup>2</sup> Excel lookup functions take the nearest value that is lower, thus are likely to provide underestimate of the damages. Note though that there is no guarantee that interpolation provides more accurate figures, it just appears so if damages for the actual flooding depths are used. Estimate of 30% error based on an Excel lookup function taking damages for a flood depth of 0.1 for residential sector average for actual flood depth of 0.19.

**Table 9.1 What is the problem?**

Problem	Significance in terms of ...	
	Approach used	Appraisal outcome
Sensitivity analysis is not addressing the key areas of uncertainty	High	High
Sensitivity analysis is not being undertaken in a consistent manner – but this is only an issue where the key uncertainties are the same	High	Medium
Sensitivity analysis is being undertaken as the last 'hoop' to go through, it does not appear to influence selection of the preferred option	Medium	High

Table 9.1 shows that the main problems are linked to not addressing key sources of uncertainty in the sensitivity analysis. There is a lack of consistency in approach, but this is not important unless the key areas of uncertainty are the same. It is more important that the sensitivity analysis tests the robustness of the option selection to changes in those factors that are driving the decision. Thus, if benefit estimates have an uncertainty of 100%, does halving or doubling the benefits change the choice of option? If so, how can uncertainty in the benefits be reduced such that the most robust option can be selected?

The next step is to identify the causes of the problem, in order to determine if the problem can be solved by changes to the guidance or requires other changes to be made.

### What are the causes of the problem?

Table 9.2 sets out the cause of each problem identified in Table 9.1 as having an effect on the use of sensitivity tests. This draws on evidence from consultation, in particular the workshops and detailed questionnaire. The table provides an indication of the extent that each cause is driving the problem.

**Table 9.2 What are the causes of the problem?**

Problem	Causing problem	Influence on problem
Sensitivity analysis is not addressing the key areas of uncertainty	There is a lack of guidance on how to deal with uncertainty	High
	There is a lack of understanding on the uncertainty of various parameters (e.g. modelling, flood depths, depth-damage data, etc.)	High
	Use of spreadsheets results in everything being given to the nearest pound (or penny) such that information and understanding of uncertainty and sensitivity is being lost	Low
Sensitivity analysis is not being undertaken in a consistent manner	Consistency is only required where there are similar uncertainties, which links back to a lack of guidance on how to deal with uncertainty	High

**Table 9.2 What are the causes of the problem?**

<b>Problem</b>	<b>Causing problem</b>	<b>Influence on problem</b>
Sensitivity analysis is being undertaken as the last 'hoop' to go through, it does not appear to influence selection of the preferred option	Lack of time to undertake an iteration once the sensitivity analysis has been completed	High
	Links to lack of understanding of uncertainty, lack of guidance and emphasis of appraisal process on completing the PAR and obtaining funding, not on identifying the best, most robust option	High

Table 9.2 shows that the main causes of the problems can be linked to a lack of guidance on how to deal with uncertainty (agreed with by 83% of respondents to the detailed questionnaire), but also to a lack of understanding of what is causing uncertainty in the appraisal process. For example, the use of spreadsheets was highlighted as leading to less understanding of uncertainty in the workshops. In principle, spreadsheets should help improve understanding of uncertainty as input data can be easily changed and the results immediately seen. For example, changes to the year when a breach occurs or when erosion is expected can be altered allowing the sensitivity of the results to large or small changes to be investigated. This should give an idea of the sensitivity of the results to such changes.

There is again the issue of time pressures, where sensitivity analysis tends to be one of the last items in the appraisal such that there is little scope for the results to feed back through the appraisal. This will have knock-on implications in terms of opportunities for optimisation.

The next step is to consider what solutions are required to tackle the causes of the problems.

### **What are the solutions?**

Table 9.3 sets out potential solutions for each cause and each problem. Some of the causes require more than one solution, or have alternative solutions. For each solution, action that can be taken is described with the ease of implementation also given (ranging from easy to difficult). Where possible, the solutions are linked to existing process or appraisals. Evidence of the solutions is drawn from consultation, and from the review of guidance documents and appraisal processes used in other fields.

Table 9.3 shows that there are possible solutions to all of the causes of the problems. Many of these solutions require other actions to be put into place such that the changes will take time.

The key solution will be to change the focus of the sensitivity analysis from the final part of the appraisal, to an integrated part that can help inform the selection of the preferred option. This requires more information on uncertainties associated with different factors so the uncertainties within each option can be better assessed. This is likely to require more emphasis (and hence time) on

the sensitivity analysis so will have to be undertaken in association with a move to an appraisal process and guidance that are focused around risk and uncertainty (see also Section 4). Sensitivity analysis at the end of the appraisal should be focused more on switching values (i.e. how much do the costs/benefits have to increase/decrease by to change the choice of the preferred option) with discussion as to whether the change required to result in a different preferred option is realistic or not. These points highlight that sensitivity analysis has to be tailored to the specific requirements of the project that is being appraised. The guidance needs to focus on how to identify which parameters are associated with the greatest uncertainties and approaches to assessing the sensitivity of the decision to changes in those parameters. An appraisal that can show (e.g. in the Project Appraisal Report) that the sensitivity of the decision has been fully tested will provide a much more robust case for approval.

Appraisal processes used in other fields include those that use low and high estimates or probability ratings through the appraisal (e.g. DfT 2002), such that uncertainty is associated with the input data. Sensitivity tests are also undertaken. Other guidance set out specific sensitivity tests, e.g. Defra (2001) includes the use of Monte Carlo analysis on the total cost curve for reduction in emissions. For benefits, sensitivity tests include use of different populations, changes to mortality rates associated with long-term effects and consideration of different types of health effects. DfT (2004) (COBA Manual) recommends that sensitivity tests are carried out on *'variables which are both uncertain in the local context and likely to affect the result significantly'*. It also notes that *'sensitivity tests are not costless to carry out and need to be considered carefully'*.

It may be possible to provide a quick-fix solution by providing guidance on why sensitivity analysis is undertaken, accompanied by information on the likely uncertainty with key datasets (e.g. depth-damage data). This could be linked to approaches with a formalised mechanism for assessing uncertainty, such as FutureCoast. However, the application of more detailed sensitivity analyses tailored to the specific requirements of the project whose aim is to inform back on the robustness of the options and, hence, influence selection of the preferred option will require more time and effort. This would increase the cost of appraisals, which are already perceived as being too expensive and time-consuming. Therefore, the quick-fix solution may result in additional problems.

**Table 9.3 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
There is a lack of guidance on how to deal with uncertainty	There is a clear need for some guidance on this issue to highlight why sensitivity analysis is required as much as the process of doing so. This will need to be accompanied by worked examples illustrating how to determine which areas have the greatest uncertainty	Need for clear concise guidance on why sensitivity analysis is required and how it could be used – but will raise time issues	Moderate – development of guidance should be straightforward but application of sensitivity analysis is likely to be linked to available time
There is a lack of understanding on the uncertainty of various parameters (e.g. modelling, flood depths, depth-damage data, etc.)	There needs to be better reporting on the uncertainty associated with data provided (or methods that can be used to ascertain what the uncertainty may be), where possible with indications of uncertainty as a % or band	Need for more information to be provided alongside datasets so users can understand the degree of uncertainty	Moderate to difficult – may be easier for some datasets (e.g. depth-damage) than others, e.g. modelling
Use of spreadsheets results in everything being given to the nearest pound (or penny) such that information and understanding of uncertainty and sensitivity is being lost	Likely to be linked to skills base and use of spreadsheets by those who have the knowledge and time to investigate the impact of changing certain input data	Requires careful spreadsheet design and time to undertake investigations required	Difficult – key issue may be time. Could also require redesign of FCDPAG3 spreadsheets
Consistency is only required where there are similar uncertainties, which links back to a lack of guidance on how to deal with uncertainty	Need to provide flexibility in approach to sensitivity analysis to allow appraisers to identify and test the key uncertainties specific to their project	Requires guidance to focus on reasons for sensitivity analysis rather than set out a process (has to avoid perception that sensitivity analysis is 'handle turning')	Moderate – requires trust in appraisers and approvers to accept that not all sensitivity analyses will undertake the same tests
Lack of time to undertake an iteration once the sensitivity analysis has been completed	Need to build sensitivity analysis into the overall appraisal process - not just something to be done at the end once the decision have been made	Needs refocus of appraisal process and guidance linked to risk and uncertainty (see Section 4)	Moderate to difficult – requires lots of other changes to be made
Links to lack of understanding of uncertainty, lack of guidance and emphasis of appraisal process on completing the PAR and obtaining funding, not on identifying the best, most robust option	As above, need to change perceived role of sensitivity analysis to one that can help inform and identify the preferred option	As above, needs to be linked to change in emphasis from comparing options to learning about the options through appraisal	Difficult – requires change to appraisal, guidance and attitudes

### 9.3 What is the uncertainty in appraisal decisions (and components) at different scales of analysis?

#### What is the problem?

The review of PARs has shown that it is very difficult to determine the level of uncertainty at different scales of analysis based on information included in the PARs and the accompanying appendices (where available). Very few PARs report on the likely uncertainty in benefits, with uncertainty in costs represented to some degree by the reduction of optimism bias from the standard 60% or 30%. Of a sample of 20 PARs available electronically, thirteen do not mention 'uncertainty' at all in the PAR, while three mention uncertainty once, and two mention it twice. The remaining two PARs mention uncertainty several times: one mentioning it four times, always in relation to costs. Only Middle Medway PAR (of the sample of 20) attempts to link uncertainty through to the sensitivity analysis and the changes made to both costs and benefits.

There is also very little information on the potential causes of uncertainty in base data, in modelling and in other key assumptions that will affect estimation of the benefits. Some PARs do attempt to use methods to audit data used by assigning data quality codes (e.g. best of breed, data with known deficiencies, gross assumptions, heroic assumptions), but even where this is done it does not feed through to identifying the likely level of uncertainty.

The average level of optimism bias applied is 42%, with a range from 5.7% to 60%. Higher rates of optimism bias tend to be linked to strategies, with lower rates linked to schemes, but this probably reflects the guidance as much as potential uncertainty within the cost estimates. Many of the PARs report use contractors to provide and/or verify cost estimates, or the use of cost workshops. Such approaches may assist in reducing uncertainty to some extent; other uncertainties are addressed through the use of risk registers.

Table 9.4 summarises the problems related to uncertainty in appraisal decisions at different scales of analysis. The significance of each problem is also indicated in terms of how it affects the approach being used and its influence on the outcome of the appraisal. The table draws in evidence from consultation (particularly the workshops), the review of Project Appraisal Reports and the existing set of FCERM guidance.

**Table 9.4 What is the problem?**

Problem	Significance in terms of ...	
	Approach used	Appraisal outcome
There are very few mentions of uncertainty in the PARs, let alone the impact of uncertainty on key assumptions	Medium	Medium
Basic data are not given that would allow the level of uncertainty to be determined	Medium	High

**Table 9.4 What is the problem?**

Problem	Significance in terms of ...	
	Approach used	Appraisal outcome
Uncertainty tends to only be linked to costs, with very few PARs discussing uncertainty of the benefit estimates	High	High

The next step is to identify the causes of the problem, in order to determine if the problem can be solved by changes to the guidance or requires other changes to be made.

### What are the causes of the problem?

Table 9.5 sets out the cause of each problem identified in Table 9.4 as having an effect on the use of sensitivity testing. This draws on evidence from consultation, in particular the workshops. The table provides an indication of the extent that each cause is driving the problem.

**Table 9.5 What are the causes of the problem?**

Problem	Causing problem	Influence on problem
There are very few mentions of uncertainty in the PARs, let alone the impact of uncertainty on key assumptions	Issue of a potential lack of understanding of what is causing uncertainty in the data sets being used (due to lack of information on uncertainty within the data sets themselves)	High
	Lack of time to assess uncertainty in key assumptions and to test this in the sensitivity analysis (see also Section 9.2)	High
	Use of 'black box' approaches (e.g. MDSF) that mask uncertainty and can give the perception that the answer is accurate	Medium
Basic data are not given that would allow the level of uncertainty to be determined	Data and assumptions are not being interrogated to determine their uncertainty	High
Uncertainty tends to only be linked to costs, with very few PARs discussing uncertainty of the benefit estimates	Focus on providing verified cost estimates and revising the optimism bias or applying Monte Carlo analysis (or similar)	High

Table 9.5 shows that the main problems are caused by a wide variety of factors, including the time and information needed to investigate uncertainty such that it can feed into the appraisal and be used to inform the sensitivity analysis. A lack of information on uncertainty associated with data sets used to support the economic analysis means that there is no reference point from which to measure uncertainty. Furthermore, the use of 'black box' approaches such as MDSF can mask uncertainty, providing an answer that appear accurate and where it can be difficult to assess which assumptions are associated with the greatest uncertainty.

The next step is to consider what solutions are required to tackle the causes of the problems.

### What are the solutions?

Table 9.6 sets out potential solutions for each cause and each problem. Some of the causes require more than one solution, or have alternative solutions. For each solution, action that can be taken is described with the ease of implementation also given (ranging from easy to difficult). Where possible, the solutions are linked to existing process or appraisals. Evidence of the solutions is drawn from consultation, and from the review of guidance documents and appraisal processes used in other fields.

Table 9.6 shows that there are possible solutions to all of the causes of the problems. Many of these solutions require other actions to be put into place such that the changes will take time.

The solutions required are based not only on changes to the way that data are presented, but will need to be accompanied by a change in attitudes and approaches. This is also likely to require additional time and may be difficult to implement within the current approach. Thus, it may be best introduced as part of a refocusing of the whole appraisal process such that it is based on risk and uncertainty. Guidance will be required explaining how information on uncertainty (that will be needed on key data sets) should be used and how this should inform sensitivity analysis.

**Table 9.6 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
Issue of a potential lack of understanding of what is causing uncertainty in the data sets being used (due to lack of information on uncertainty within the data sets themselves)	Need for providers of data sets to include information on the likely level of uncertainty (e.g. on the depth-damage data) in qualitative and/or quantitative terms	Need for inclusion of ranges or $\pm$ with base data (or methods that can be used to ascertain what the uncertainty may be)	Moderate – ability to provide such information in a meaningful manner may be limited
Lack of time to assess uncertainty in key assumptions and to test this in the sensitivity analysis (see also Section 9.2)	Need to build sensitivity analysis into the overall appraisal process - not just something to be done at the end once the decision have been made	Needs refocus of appraisal process and guidance linked to risk and uncertainty (see Section 4)	Moderate to difficult – requires lots of other changes to be made
Use of 'black box' approaches (e.g. MDSF) that mask uncertainty and can give the perception that the answer is accurate	Need to develop a feeling for how sensitive the results of 'black box' approaches are to changes in certain assumptions. This could be undertaken as a research project to identify common assumptions, but some project-based testing is still likely to be required	Need for testing of results from 'black box' approaches, could be done as a research project or project-by-project	Moderate – requires good understanding of uncertainty within the data and how the assumptions affect the results

**Table 9.6 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
Data and assumptions are not being interrogated to determine their uncertainty	Requires time and incentive to assess uncertainty. Building uncertainty into the appraisal process may help provide the incentive. Appraisers will need an appropriate amount of time to undertake the analyses, but also need to understand when it is worthwhile spending extra time and when it is not	Time required will depend on whether the approach to appraisal is revised. Otherwise, increasing requirements to address uncertainty will require additional time over that currently needed	Difficult – time constraints are already a major issue in terms of completing appraisals, but the amount of time and money being spent needs to be reduced
Focus on providing verified cost estimates and revising the optimism bias or applying Monte Carlo analysis (or similar)	Need to emphasise that uncertainty in the benefits is as important to decision making as uncertainty in the costs	Need for refocusing of appraisal to those elements with greatest uncertainty. This requires information to be made available on uncertainty with key data sets (e.g. depth-damage data)	Moderate- requires other changes to be put in place to encourage a change in attitude

## 9.4 Overall solutions

The main changes required include the need to emphasise the importance of understanding the influence of uncertainty on the selection of the preferred option. This needs to be drawn from information on uncertainty associated with key assumptions and data. The key will be to change the focus of the sensitivity analysis so it forms an integrated part of the whole appraisal process. This will require greater emphasis and time to be spent on the sensitivity analysis (see also Section 4), and will need a change in attitude towards addressing uncertainty with benefits as well as costs.

A short-term solution could be provided through the provision of guidance on why sensitivity analysis is undertaken, together with information on the uncertainty associated with key datasets (e.g. depth-damage data). However, this will require additional time and effort, further increasing the cost of appraisals, which are already perceived as being too expensive and time-consuming. Thus, there is a risk that the introduction of the short-term solution only would not result in the required changes to sensitivity analysis and, therefore, would not solve the problems and issues raised during this project. It is also important that provision of additional guidance does not lead to the perception that sensitivity analysis is a ‘handle turning’ exercise. Any guidance would need to specify the importance of identifying key uncertainties associated

with the project being appraised and how those key uncertainties should be investigated. Discussion on 'robustness' of the preferred option to change in key parameters should form an important part of the Project Appraisal Report.

To reduce the risks that the changes to guidance are not taken into account, it is likely to be necessary to undertake a major revision of the appraisal process and the accompanying guidance documents. This will help to ensure that sensitivity analysis has a greater influence on the choice of preferred solutions and improve understanding of uncertainty within the appraisals. Such changes may also help encourage the consideration of scenarios (e.g. climate change, land use changes) by providing a framework into which such uncertainties would more easily fit (see Section 10).



## 10. Scenarios and future changes

### 10.1 What does the current guidance say?

FCDPAG1 mentions the four UKCIP climate change scenarios and states that a pragmatic approach to dealing with climate change will need to be adopted (S6).

The identification of key sensitivities using extreme hypothetical scenarios is stated in FCDPAG2 in the estuary management example (Section 5.4) which would include modelled future changes to hydraulic processes.

Scenarios are mentioned in FCDPAG3 but the word is used to mean the same as options.

FCDPAG4 refers to the need to assess future scenarios such as those due to future development (S A3.3). FCDPAG5 makes no mention of scenarios but does identify the need to mitigate against future adverse effects (S2.4).

The CFMP Guidance explains why and how to use different scenarios to determine how the catchment may change over the long term (50-100 years) (Vol 1 S41, VII S7)). Scenarios relating to land use, development and land management practices are identified (Vol II S1.2) and suggested changes (sensitivity tests) to be appraised are given (Vol II S 6.4). The scenarios are testing through MDSF which provides the framework to support decision making (Vol II S5).

There are numerous references to scenarios in both Volumes 1 and 2 of SMP2 but in nearly all cases they refer to policy scenarios which are the policy options.

Future changes are recognised as being important in developing appropriate strategies (S3.1a) as follows: *'An understanding of the future changes will allow you to identify areas where management problems are likely to arise in the future. These areas could be:*

- *areas that will continue to change due to erosion or accretion*
- *areas that will be increasingly at risk from flooding, erosion or instability*
- *areas where maintaining existing defences is likely to become increasingly difficult or expensive*
- *areas that will become increasingly important to the shoreline and coastal defences, such as inter-tidal flats providing protection from waves.'*

The need to assess current and future land use is described as a theme to be reported on (Vol 2 Task 2.3).

There is no mention of scenarios or future changes in the MCM or MCH.

The only reference to a scenario in the Project Appraisal Report Guidance relates to the need to undertake a sensitivity check on the preferred option with

climate change and that any change to the preferred option should be clearly explained (S2.7).

## 10.2 Is the guidance on climate change understood by practitioners and applied appropriately?

### What is the problem?

This question is divided into two parts:

- do people understand what is required and why? and
- is the guidance being used correctly, is it open to interpretation or only used in specific circumstances?

The potential effects of climate change within the management of flood risk come from two sources: sea and rainfall. Possible changes with regard to the sea include:

- sea level rise (and this will also include large-scale land movement);
- wave and surge heights;
- storm frequency and intensity; and
- wind effects (direction and patterns).

Possible effects with regard to rainfall (and hence run-off) include:

- frequency, duration or intensity;
- seasonal changes; and
- regional differences.

To be able to address the above within project appraisal there needs to be not just an understanding of the potential changes that could take place over time and the uncertainty surrounding current research, but also how to use the information to provide sustainable solutions.

Table 10.1 summarises the problems related to climate change. The significance of each problem is also indicated in terms of how it affects the approach being used and its influence on the outcome of the appraisal. The table draws in evidence from consultation, the review of Project Appraisal Reports and the existing set of FCERM guidance.

**Table 10.1 What is the problem?**

Problem	Significance in terms of ...	
	Approach used	Appraisal outcome
Guidance not clearly set out and communicated to practitioners	High	High
Inconsistency between Guidance and other FCERM (e.g.Foresight)	High	High

**Table 10.1 What is the problem?**

Problem	Significance in terms of ...	
	Approach used	Appraisal outcome
Inconsistency between Guidance for coasts and rivers	High	High
Uncertainty in climate change scenarios not explained	High	High
No Guidance on how to incorporate CC uncertainty into decision making	High	High

Table 10.1 shows that the problems arise from lack of clear guidance on not only how to address climate change and include it in appraisals but also how the information is used in the decision process. This was voiced very strongly at all the workshops. This is also reflected in the PARs where there is a specific reference to the inclusion of climate change in the PAR Guidance but this was not carried through to the reports in all cases.

The next step is to identify the causes of the problem, in order to determine if the problem can be solved by changes to the guidance or requires other changes to be made.

### What are the causes of the problem?

Table 10.2 sets out the cause of each problem identified in Table 10.1. This draws on evidence from consultation, in particular the workshops. The table provides an indication of the extent that each cause is driving the problem.

**Table 10.2 What are the causes of the problem?**

Problem	Causing problem	Influence on problem
Guidance not clearly set out and communicated to practitioners	Guidance is difficult to find, can be out of date and therefore not consistent with current thinking in Foresight and MSfW	High
Inconsistency between Guidance and other FCERM initiatives (e.g. Foresight)	Guidance has not kept up with policy	High
Inconsistency between Guidance for coasts and rivers	Guidance for coasts is prescriptive which is not the case for rivers	Med
Uncertainty in climate change scenarios not explained	No Guidance on what to do if outcome is shown to be sensitive (S9)	High
No Guidance on how to incorporate CC uncertainty into decision making	Method of applying impacts within decision making and over timescales (e.g. 100 year period not understood)	High

Table 10.2 shows that the main cause of the problems is that some guidance is available but is not in a readily accessible form or easy to access. However, guidance on sea level rise is explicitly covered in FCDPAG guidance, as is the

use of a 20% increase in river flow as a sensitivity analysis (refer to Task C). It would appear therefore that other information, such as the publicity surrounding research as published in, for example the national press, giving conflicting information, the uncertainty surrounding climate change and the lack of clear guidance on how to incorporate climate change uncertainty in the decision process is causing the problem. This may not be helped by potential climate changes being discussed within the context of scenarios. The scenarios are 'what ifs' and although appraisers are used to dealing with probabilities the use of scenario analysis especially in the context of sustainable solutions is not understood. This would again point to the need for better guidance.

The next step is to consider what solutions are required to tackle the causes of the problems.

### **What are the solutions?**

Table 10.3 sets out potential solutions for each cause and each problem. Some of the causes require more than one solution, or have alternative solutions. For each solution, action that can be taken is described with the ease of implementation also given (ranging from easy to difficult). Where possible, the solutions are linked to existing process or appraisals. Evidence of the solutions is drawn from consultation, and from the review of guidance documents and appraisal processes used in other fields.

Table 10.3 shows that there are possible solutions to all of the causes of the problems. Many of these solutions require other actions to be put into place such that the changes will take time.

The need for clearer, consistent and up to date guidance on how climate change should be incorporated into appraisals and clearer advice on decision making are obvious solutions. The very nature of climate change being uncertain and timescales make this topic more difficult to address in appraisals as it guides the decision maker more towards future adaptation than providing a solution now. In many of the PARs, especially coastal ones, sea level rise is included in the analysis as set out in the guidance. However, this appears to be undertaken in a mechanistic way with little or no thought or analysis of the implications for optimisation or sustainability of options. Other possible effects of climate change are rarely covered or even mentioned. R&D Project FD2020 did identify a few projects where defences were raised or capacity increased now to accommodate either sea level rise or 20% increased flow in the future (Task C). This of course will only be the best solution if the climate change parameters are realised in the future otherwise the scheme could be over or under designed. The comment from the project was the small number of appraisals where climate change had been taken into account in the solution and they identified that there was a need for additional detail in the guidance.

**Table 10.3 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
Guidance is difficult to find, can be out of date and therefore not consistent with current thinking in Foresight and MSfW	Separate guidance on climate change that provides the most up to date information (and how it is being used to guide policy)	Guidance in a format that can be easily updated and communicated	Moderate - if using electronic format
Guidance has not kept up with policy	Clear links from policy (Defra) to process  Clear lines of communication  Translation of latest research advising policy into data that can be used in appraisals	Constant dialogue between policy makers and those preparing/updating guidance	Moderate – may need clearer defined roles for individuals
Guidance for coasts is prescriptive which is not the case for rivers	Guidance for coasts presented in such a way that it includes uncertainty	Need to separate climate change effects that are happening from those that are future scenarios	Moderate to difficult – will need a change to the way guidance is presently presented
No Guidance on what to do if outcome is shown to be sensitive (S9)	Guidance required on incorporating uncertainty in decision making and linking with sustainability and optimisation	Guidance required on decision making and decision making techniques especially relating to uncertainty appropriate for FCERM	Difficult – requires new section within guidance on decision making and uncertainty that is in a form easily understood but not in a mechanistic way
Method of applying impacts within decision making and over timescales (e.g. 100 year period not understood)	Clearer Guidance on use of scenario analysis based on epochs such as SMP2 and CFMP guidance	New guidance required with emphasis on how to relate uncertainty to options that include adaptation and sustainability	Difficult – decision making is not an easy subject to provide guidance for unless it is 'black & white'. Dealing with uncertainty and scenarios within the appraisal process will be challenging and will need additional skills

### 10.3 What problems do practitioners have regarding climate change and are there any particular topics for which additional guidance is needed?

There are two factors linked to this question:

- problems: what issues have arisen when climate change is considered? and
- additional guidance: can these issues be addressed by extra guidance (what?) or is it a wider issue that needs to be considered elsewhere (how?).

They are closely related to the previous question and the discussion here is on additional problems and guidance over and above that mentioned in Section 10.2.

#### What is the problem?

Table 10.4 summarises the problems related to the practical application of climate change within appraisals. The significance of each problem is also indicated in terms of how it affects the approach being used and its influence on the outcome of the appraisal. The table draws in evidence from consultation and the review of Project Appraisal.

**Table 10.4 What is the problem?**

Problem	Significance in terms of ...	
	Approach used	Appraisal outcome
Lack of understanding of how climate change is taken into account in appraisals	High	High
Appraisal and planning guidance use different approaches	High	Low

Table 10.4 shows that the problem is mainly one of lack of understanding. The problem associated with slightly different approaches to Planning Policy Guidance and project appraisal is less of an issue for appraisals but significant in terms of consistent policy.

The next step is to identify the causes of the problem, in order to determine if the problem can be solved by changes to the guidance or requires other changes to be made.

#### What are the causes of the problem?

Table 10.5 sets out the cause of each problem identified in Table 10.4 regarding problems that practitioners have regarding climate change. This draws on evidence from consultation, in particular the workshops. The table provides an indication of the extent that each cause is driving the problem.

**Table 10.5 What are the causes of the problem?**

<b>Problem</b>	<b>Causing problem</b>	<b>Influence on problem</b>
Lack of understanding of how climate change is taken into account in appraisals	Little guidance on dealing with CC in the fluvial environment	High
	PAG Guidance focuses on local options and does not take holistic approach	High
	How to address sustainability?	High
Appraisal and planning guidance use different approaches	Inconsistency of approaches for appraisal and planning (PPG25)	Medium

Table 10.5 shows that the main problem is associated with guidance being too narrow. With regard to sustainability, much of the existing guidance was published a number of years ago when sustainability was emerging as an important factor in appraisals and there was less understanding of appropriate decision making methods.

Around 50% of the appraisal processes used in other fields incorporate climate change in some form. UKCIP guidance (2003, 2004) has the aim of ensuring that climate change is fully taken into consideration in options appraisal. Dft (2001, 2005) include climate change explicitly by making it a key indicator in the Appraisal Summary Table, and listing the level of greenhouse gas emissions as an appraisal objective. Other appraisal processes take climate change into account by looking at future economic considerations and including carbon tax in the cost analysis of environmental costs and benefits. The general purpose of taking climate change into account is to help monitor and adapt projects and to allow the impacts of climate change to be described, predicted and assessed.

The next step is to consider what solutions are required to tackle the causes of the problems.

### **What are the solutions?**

Table 10.6 sets out potential solutions for each cause and each problem. Some of the causes require more than one solution, or have alternative solutions. For each solution, action that can be taken is described with the ease of implementation also given (ranging from easy to difficult). Where possible, the solutions are linked to existing process or appraisals. Evidence of the solutions is drawn from consultation, and from the review of guidance documents and appraisal processes used in other fields.

Table 10.6 shows that there are possible solutions to all of the causes of the problems. Some of these solutions require other actions to be put into place such that the changes will take time.

Again the key solution is to provide more comprehensive guidance but also a greater awareness by appraisers of 'what they are trying to do'. As discussed in

S10.2 much of the problem relates to guidance dealing with uncertainty and the future which does need addressing in more detail.

**Table 10.6 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
Little guidance on dealing with CC in the fluvial environment	This was partly dealt with in S10.2 but the present guidance to use 20% increase in flow as a sensitivity is not providing sufficient information for practitioners	The use of regional scenarios for rainfall/run-off and additional guidance on how this could advise on adaptation methods	Difficult – although the regional scenarios are available they are only scenarios and additional guidance will be need on how to use the results
PAG Guidance focuses on local options and does not take holistic approach	Wide range of options including non-structural solutions such as land-use changes need to be considered	Wide range of 'options' required and the implementation of some will be outside of the control of the appraiser	Difficult – it requires joined up decision making with other bodies
How to address sustainability?	More detailed guidance required together with case studies/example solutions	Sustainability should be a prime objective that is driving the appraisal. The appraisal process will need changing to reflect a different approach. Issues such as social sustainability will also require guidance	Moderate to difficult – requires change of emphasis in appraisal process and brings in areas to address that are currently only mentioned in passing with no agreed method for including in appraisals
Inconsistency of approaches for appraisal and planning (PPG25)	Consistent approach in all guidance relating to flood risk management	There are compelling reasons why there is not a consistent approach. Guidance to developers needs to be prescriptive and unambiguous (otherwise it will be challenged legally). Whereas guidance for FCERM projects can afford to take an approach that can deal with uncertainty and future adaptation	Difficult – information is being provided for different applications

## **10.4 Should there be standard sets of scenarios or should they depend on certain current factors?**

The use of standard sets of scenarios would no doubt be welcomed by practitioners and there would be a perceived degree of consistency nationwide. Nearly all the respondents to the detailed questionnaire stated that scenario analysis would be useful especially in guiding the thought process and decision making and ‘future proofing’ potential schemes. Foresight uses four scenarios described as a portfolio of responses and only 9% of respondents suggested using this approach. The majority of respondents wanted scenarios that reflected local conditions relevant to the project. The CFMP guidance takes a slightly different approach from Foresight in that it involves the assessment of various influences that can make a difference to the flood risk (probability and consequence) of flooding in the catchment. To this end it recommends investigating potential changes such as:

- land use , such as new development or significant changes in the developed environment;
- changes in the rural landscape, including large scale changes in land management;
- loss of, or potential threat to, wildlife habitats or biodiversity;
- measures to reduce the effects of floods on communities; and
- climate change.

This has been undertaken in a number of CFMPs but it is not clear how this has been used in deciding on the preferred policy options.

The three workshops asked a specific question on scenarios – “should scenarios be used?” There was general comment on the need for clear definitions and terminology and also why and how they were to be used. Scenario analysis was seen as complex and requiring additional cost, but could save money in the future. The scenarios should include not just different climate change drivers but also social, economic and political changes.

The present appraisal guidance only allows for future potential change in respect of sea level rise and this is given as mm rise per year in sea level for geographic coastal regions. The increase in levels therefore gives rise to additional impacts over the appraisal timescale. This is not a scenario and the guidance does not recommend sensitivity testing of changes to sea level rise.

The general view from the detailed questionnaire was that there was a lack of joined up thinking leading to a discrepancy between policy, research outcomes and guidance. This was seen as a much wider problem (75% of respondents to the detailed questionnaire) than could be dealt with by changes to the guidance.

Scenarios are not used widely in other appraisal processes, with approaches tending to be tailored to the project area being considered. For example, HSE (2001) guidance ‘Reducing risks, protecting people’ looks at the most likely worst-case scenario through to the ‘worst case possible’ and ranks them depending on the degree of uncertainty. UKCIP (2003) discusses the use of

scenarios to investigate uncertainty. The aim is to use the scenarios to help determine the nature of both climate and non-climate dependent risks. The Scottish Executive Development Department (2004) guidance on road schemes includes high and low growth scenarios, which incorporate the performance of the economy and any risk or fall in prices for commodities.

There is therefore an identified need for clear thinking on how scenarios (climate change, social and economic) should be used to inform decisions. The assessment of future development is discouraged in FCDPAG3 and this has tended to steer appraisers away from future possible changes within catchments/benefit areas under consideration. A clear way forward on what scenarios to use and how these relate back to research and policy is required and a much greater emphasis in guidance for decision making for sustainable and adaptable solutions.

## **10.5 How should the results of different scenarios be weighted?**

There are a number of scenarios that can be used in FCERM appraisals including those relating to climate change, land-use and social changes within an area (Task C). At present there is no agreed set of scenarios therefore the question on weighting the results is somewhat premature.

Questions that should be asked are:

- should we allow future attitudes (which are uncertain) to over-ride today's attitudes? and
- how should we be looking at avoiding irreversible decisions now?

In respect of guidance for appraisals, a way of encouraging adaptability and flexibility without penalising the current generation of taxpayers should be addressed within guidance on sustainability (S10.3).

## **10.6 Overall solutions**

The use of scenarios can provide valuable information to the decision makers on potential impacts from future changes. The potential changes can include those associated with climate change, land use, social behaviour, and combinations thereof. The one thing all these potential changes have in common is that there is uncertainty as to the timing and degree of impacts.

There needs to be a rethink on how appraisals take into account future potential changes such as climate change and land use, and a way of ensuring the most up to date policy is used. To be able to use this information and inform decisions there is a need for much clearer guidance on decision making including incorporating scenarios, uncertainty and linking this with sustainability, adaptation and optimisation (see also Sections 9, 11 and 12). This highlights the need for a complete review and revision of the guidance such that inclusion

of aspects such as climate change and scenarios is not perceived as an additional task, further adding to the time and resources required.

The evidence gathered for this project (including that in Task C) has identified a number of ways of approaching scenario analysis from taking potential projections for climate change to using stakeholders to identify possible management/land use changes. What has been found to be missing is any methodology or guidance on how the results of the scenario analysis should be used in decision making. Obviously care has to be taken otherwise the uncertainty will drive the decision-maker not to make a decision.

Table 10.7 summarises some of the key problems faced by flood risk management that could be addressed by the use of scenarios.

**Table 10.7 Summary of potential benefits of scenario analysis for flood risk management**

<b>FCERM problems</b>	<b>Potential benefit when using scenario analysis</b>
Complexity, uncertainty and areas of conflicts generate multiple and often divergent perspectives within a group	Scenario analysis allows multiple scenarios to be generated and despite differences between group members, scenarios generate a common language (Ringland 2002 in Winterscheid 2006)
Complexity hampers access to the system structure	Scenarios challenge mental models about the world and reduce limits on creativity and resourcefulness (Schwartz 2002 in Winterscheid 2006)
Difficulty of communicating and understanding flood risk	The narrative and participative form of scenarios allows stakeholders to include their knowledge in the generation phase and can also help improve flood risk perception (Winterscheid 2006)
Decreasing support for the implementation of measures in times without flooding	Scenarios are a forum for learning. Their presentation to external groups will stimulate feedback and debate (Ringland 2002 in Winterscheid 2006)

However, Winterscheid (2006) also identifies that research is needed to define the particular needs, procedures and requirements for the application of scenario analysis to flood and coastal erosion risk management problems.

In order to be able to use scenario analysis an agreed definition is required to ensure that there is a consistent approach within the FCERM field. This could be developed as part of new guidance and suggested definitions are as follows:

*'A scenario is a possible future situation and includes a description of the developments that have led to that particular future.'*

*'Scenario analysis is a tool for improving decision making against a background of possible future environments. It helps us rehearse our response to those possible futures.'*

This is then different from sensitivity analysis which does not include a description of how that possible future situation may arise.

Scenario analysis could lead to solutions that are adaptable over time and can accommodate changes as they occur. Guidance on scenario analysis should include the following:

- scoping of possible changes to drivers;
- scoping of possible changes to receptors;
- screen out any that will have little or no effect;
- analyse the options under different scenarios;
- screen out options that cannot be adapted (or consider costs of getting it wrong);
- compare remaining options (combining if necessary); and
- choose 'preferred' option that provides optimal solution (in terms of risk reduction, maximum benefit, least cost and potential for adaptation).

Further research (and guidance) is required as the evidence identified in this project highlights that there are few other fields that are currently using scenario analysis in a way that can inform decision-making. Thus, there are no direct analogies from which approaches can be taken and amended to FCERM projects.

# 11. Decision-making and optimisation

## 11.1 What does the current guidance say?

### *Decision-making*

FCDPAG1 states that the purpose of the project appraisal process is to improve decision making and that good decision making will always include a role for informed consultation and negotiation and appeals and formal adjudication (S2.3.2). There is then a chapter on decision making (S5) which stresses the need for decision making not to rely on chance but on a full and informed consideration of all the relevant factors (S5.1).

In FCDPAG2 the approach to decision-making not explicitly covered and it refers to FCDPAGs 3 and 5 for the decision on the preferred option. Consultation is covered in S3.4.8 where a prime function is described as: *'to build a framework of relationships with stakeholders to develop ownership of flood and coastal defence problems and partnerships committed to finding acceptable solutions.'*

The decision process is included in FCDPAG3 in S6 'Choosing the option'. The main decision tool is the 'decision rule' which is based on a procedure using indicative standards, the b/c ratio and incremental b/c ratio. However, it adds: *'it is recognised that benefit–cost analysis is but one tool available to aid decision making. An authority may be justified in proceeding with an alternative where other exceptional factors influence choice. These could include:*

- *uncertainty regarding the economic outcomes of a particular option which it has not been possible to incorporate adequately into the preceding analysis (see FCDPAG4);*
- *environmental considerations for which it has not been possible to assign monetary values (see FCDPAG5);*
- *irrevocable planning constraints;*
- *availability of funds (affordability).'*

There are also a number of examples on the interpretation of cost/benefit profiles (S6.2.1-3). Optimisation is not specifically covered apart from the need to identify a wide range of options (S3.2).

The use of qualitative and quantitative risk assessments to support decision-making is described in FCDPAG4 with an example given of a risk matrix (Example D). FCDPAG4 states that: *'There is no specific approach that can be adopted for selection of a preferred option, as this depends upon the relative importance of the risks being assessed and the acceptable level of each individual risk.'*

FCDPAG5 states that: *'Identifying the best option requires careful consideration of environmental issues alongside economic and other issues.'* (S2.1.4).

An iterative approach to preferred policy selection is advocated by CFMP Guidance (VI S 5.4.8) and *it must be clear, robust and auditable* but no guidance is given on how this can be achieved. The use of forms to collate relevant information is stated in Vol II (S12.3.2) and the preferred policy is obtained from the interpretation of this information. The development of CFMPs relies heavily on consultation with the Steering Group at defined stages of the process.

The main issues and opportunities and restrictions that have to be considered in developing an SMP are covered in the SMP Guidance (Vol I S3 & Fig E). The preferred scenario is the one which: *'best achieves the defined shoreline management objectives and is most sustainable, i.e. technically feasible, environmentally acceptable and socio-economically viable.'* (Vol II Task 3.3) – Appendix H provides guidance on some techniques for policy options appraisal and how to compare them and hence identify the preferred policy. Consultation is an integral part of developing an SMP and a preferred policy, and guidance is given on how and when to involve them (Vol I S2.5).

The benefit-cost ratio and net present value are identified in both the MCM and MCH as the two criteria most frequently used in making a decision (MCM S2.8 & MCH Ch2). There is reference to the decision rule in FCDPAG3 and for the need to modify the decision: *'as necessary to take account of factors that are not fully counted in the economic analysis.'* The importance of consultation in various locations is highlighted, e.g. critical to the achievement of a just process and a right decision is stakeholder involvement (MCM S2.3). It also states that: *'This involvement needs to be included in the definition of the problem through to identification of options and the assessment of the relative importance that should be given to achieving the different objectives.'* (MCM S2.3).

Project Appraisal Report Guidance refers to decision rule in FCDPAG3 and also the need for the preferred option to be that identified on technical and environmental grounds (S2.8). Consultation is mentioned only in the context of the (formal) approvals needed.

### **Optimisation**

Optimisation is not covered explicitly in any of the guidance documents. All the guidance points to the need for a range of options to be considered and the iterative stages in benefit-cost analysis are described in FCDPAG3 (S3.7).

CFMP states the need to consider integrated policies and the MCM notes that the appraisal process needs to be iterative (MCM S1.6).

## 11.2 Are indicative standards and the decision rule used consistently?

### What is the problem?

Section 6 discusses the use of indicative standards in terms of selecting options for appraisal. This section focuses on the role of indicative standards in terms of selecting the preferred option and use of the decision rule.

The review of PARs showed that 35 of the 67 PARs appeared to follow the FCDPAG3 decision rule correctly, with a further 16 following it partly. For some of the PARs reviewed, the decision rule is not relevant (erosion schemes, environmental schemes, SMPs and CFMPs, older PARs completed before FCDPAG was published). Some of the PARs did not describe in any detail how the preferred option had been selected, making it difficult to determine if the FCDPAG3 decision rule had been followed.

Forty of the PARs reported the indicative standards (but not always the Land Use Band or why a particular indicative standard was taken, see also Section 6). The decision rule requires identification of the indicative standards such that the appropriate incremental benefit-cost ratio (IBCR) can be determined (although this is not always relevant, e.g. for erosion schemes). Many of the PARs did not describe using the IBCRs when setting out how the preferred option had been selected. Some PARs set out the options such that they were not incremental to one another, so the use of IBCRs would have been flawed if they had been used. Other PARs only considered one standard of protection such that IBCRs are not relevant.

Table 11.1 summarises the problems related to use of indicative standards and the FCDPAG3 decision rule. The significance of each problem is also indicated in terms of how it affects the approach being used and its influence on the outcome of the appraisal. The table draws on evidence from consultation and the review of Project Appraisal Reports and the existing set of FCERM guidance.

**Table 11.1 What is the problem?**

Problem	Significance in terms of ...	
	Approach used	Appraisal outcome
Lack of information in some of the PARs to determine if the FCDPAG decision rule has been applied correctly	Medium	High
Apparent lack of understanding of where options are/are not incremental to one another	High	High

Table 11.1 shows that the problems are related to the way information is presented. Thus, there may be no misunderstanding of where/when an option is incremental over another option, but this is not always how the information supporting selection of a particular option is presented. In some cases, there

are difficulties in determining which options would provide a higher standard of protection because of differences between options and the protection offered. This links back to the use of alternative solutions and non-structural solutions where the standard of protection being provided may be more uncertain. In such cases, the options have often been ordered in terms of benefits. However, the inclusion of a wider range of benefits (environmental and social) may mean that there is not an increase in benefits as standard of protection increases (as there is with property damages). Thus, difficulties in applying incremental benefit-cost ratios may increase in the future. The issue of balancing different types of impacts and benefits is discussed further in Section 11.3.

The next step is to identify the causes of the problem, in order to determine if the problem can be solved by changes to the guidance or requires other changes to be made.

**What are the causes of the problem?**

Table 11.2 sets out the cause of each problem identified in Table 11.1 as having an effect on whether indicative standards and the decision rule are used consistently. This draws on evidence from consultation, in particular the review of PARs. The table provides an indication of the extent to which each cause is driving the problem.

**Table 11.2 What are the causes of the problem?**

<b>Problem</b>	<b>Causing problem</b>	<b>Influence on problem</b>
Lack of information in some of the PARs to determine if the FCDPAG decision rule has been applied correctly	Lack of confidence of appraisers to provide a fully transparent appraisal	Medium
	Lack of time to prepare the appraisal and report	High
	Appraisal process and guidance that are focused around completing the PAR and obtaining funding	High
Apparent lack of understanding of where options are/are not incremental to one another	Lack of skills to undertake the appraisal	Medium
	Difficulty of comparing some option types with each other (where standards of protection are uncertain or variable)	High

Table 11.2 shows that the main causes of the problems are similar to those arising as causes of problems for other issues, namely time, lack of transparency in the appraisal report, and a focus on preparing a report that will be approved and funding provided.

The next step is to consider what solutions are required to tackle the causes of the problems.

## **What are the solutions?**

Table 11.3 sets out potential solutions for each cause and each problem. Some of the causes require more than one solution, or have alternative solutions. For each solution, action that can be taken is described with the ease of implementation also given (ranging from easy to difficult). Where possible, the solutions are linked to existing process or appraisals. Evidence of the solutions is drawn from consultation, particularly the workshops.

Table 11.3 shows that there are possible solutions to all of the causes of the problems. Many of these solutions require other actions to be put into place such that the changes will take time.

Transparency in the current PAR reports could be encouraged through the use of a supplementary guidance note encouraging appraisers to justify all of their decisions in the PAR. However, this must not be seen (either by appraisers or approvers) as providing the basis for rejection of appraisals, but rather to inform the approvers why certain actions have been taken. On its own, the provision of the additional guidance may be easy to implement. However, there will be additional time requirements to provide the extra information (given the lack of justification currently included in PARs), which may make appraisers resistant to the change.

Use of the decision rule is likely to increase in complexity if other (non-money) benefits are included in the appraisal (e.g. through the use of ASTs, MCA, etc.). This will make the use of the incremental benefit-cost ratio less important since a higher standard may have dis-benefits (e.g. environmental, aesthetic) that are only rarely taken into account at present. Furthermore, the inclusion of more non-structural solutions is also likely to make it more difficult to determine the order in which options are incremental to one another. This lends itself more naturally to decision making through the use of an appraisal process based on risk and uncertainty. The aim would be to move towards the best solution, based on economic, environmental and social criteria, and by combining bits of options (probably structural and non-structural). This is likely to lead to an approach that looks to identify the least-cost option (where least costs includes not only the cost of construction and maintenance, but also costs in terms of dis-benefits or damages). Such approaches are used in many guidance documents and appraisal processes used in other fields. Good examples can be drawn from COBA (DfT 2004) and Scottish Executive Development Department (2002).

**Table 11.3 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
Lack of confidence of appraisers to provide a fully transparent appraisal	Guidance needs to encourage production of PARs that justify why particular decisions have been made, emphasising that this does not just relate to final decisions (i.e. selection of preferred option) but assumptions, etc. made during the course of the appraisal	Need for clear, concise guidance setting out need for transparency. Will need to be linked to revision of PAR guidance	Easy – would require supplementary note highlighting importance of transparency, but needs to emphasise that this is a ‘must do’
Lack of time to prepare the appraisal and report	Need for more time for ensuring that assumptions made are appropriate (but time taken is already too long), therefore, links need to be made to appraisal and guidance focused on risk and uncertainty (see also Section 4)	Need for fair specifications that appreciate the time required to undertake the appraisal and prepare reports, but also needs to be linked to better guidance on level of detail required and appraisal process based on risk and uncertainty	Moderate to difficult – requires change of focus on appraisal process, revision of guidance and change in attitude from all those involved in project appraisal (see also Section 4)
Appraisal process and guidance that are focused around completing the PAR and obtaining funding	As above, this needs a refocusing of the appraisal process to using it to identify the best possible solution, not as a hoop to go through to obtain funding	Need for change in approach to appraisal and guidance (see Section 4)	Difficult – requires change in appraisal process, guidance and attitudes
Lack of skills to undertake the appraisal	Linked to time required since those who have the skills cannot spend the time undertaking all of the appraisals. Also new people need to be given the opportunity to learn	Need for guidance and training that can help users at all levels. This is likely to be tiered guidance providing information at different levels (see Section 3)	Moderate to difficult – needs appraisal process and guidance to be reviewed and revised but involvement of eventual users during development could be used as training, that could then be cascaded down through organisations

**Table 11.3 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
Difficulty of comparing some option types with each other (where standards of protection are uncertain or variable)	This will get more difficult as other (non-money) benefits are brought into the appraisal process and highlights the need to focus the appraisal on risk and uncertainty, so the aim is to move towards the best overall solution	Need for refocusing of appraisal to avoid this issue becoming very difficult to deal with at the decision-making stage (see also Section 11.5)	Moderate to difficult – requires change of appraisal process and guidance as described above (see Section 3)

### **11.3 How have the decision rules influenced choice of option and how does this compare with alternative approaches?**

#### **What is the problem?**

The decision rule is based on an initial selection of the option with the highest benefit-cost ratio, and where options providing a higher standard of protection can be justified economically providing their incremental benefit-cost ratio exceeds a set threshold. The threshold used depends upon the indicative standards, which are determined by Land Use Bands. Therefore, the option selected under the decision rule will reflect:

- the indicative standards for the Land Use Band, hence, it is key that the project is assigned to the correct Land Use Band;
- the benefit-cost ratio of the project, hence, it is essential that as many costs and benefits as possible are included in the economic appraisal; and
- the incremental benefit-cost ratio, hence, it is important that differences between the options are fully assessed.

However, as discussed above the Land Use Band is not always being assigned correctly (see Section 6), the benefits in particular are not being fully assessed (see Section 8) and the differences between options are not always being fully explored (particularly in the sensitivity analysis (see Section 9)). Despite this, the review of PARs showed that, in most instances (47 out of 67), the option selected ‘felt’ right for the area as described in the PAR. The remaining 20 PARs often did not give enough information for the reviewer to get a feel for the area and thus what the most appropriate solution might be. However, there were five PARs where the reviewer had concerns about the option that was selected.

The first of these PARs selected an option of 1 in 200, when the economically justified option was to provide a standard of 1 in 50, and where the incremental benefit-cost ratio of the next option was just 0.4 (as opposed to a threshold IBCR of 1.5). Furthermore, this PAR appeared to have been assigned to an incorrect Land Use Band and would have been better placed in Band B (indicative standard of 25 to 100). However, the PAR explains why a higher

standard of protection had been proposed. This was based on the similarity of the benefit-cost ratios for the 1 in 50, 1 in 100 and 1 in 200 options (and the very small increase in costs required to provide a much higher standard of protection), the potential to provide a consistent standard of defence throughout the area and the climate change proofing provided by the higher standard. The sensitivity analysis only changed the costs of the options, thus, it is not possible to determine how robust the decision would be to changes in benefits.

The second PAR combined four compartments in the main economic assessment and selected a 1 in 100 year standard across the whole area as the preferred option. However, as part of the sensitivity analysis, it looked at the four compartments separately finding that there was only economic justification in two (the other two compartments having benefit-cost ratios of less than one). The justification for constructing defences to protect the whole area was that there would be a small increase in risk to unprotected areas leaving the Environment Agency open to legal proceedings by affected property owners,

The third PAR has selected what would appear to be the most appropriate option, but not by following the decision rule. Instead, the PAR focuses in on what may be an acceptable standard of protection (linked to indicative standards) stating that this has the highest benefit-cost ratio. In fact, do-minimum clearly has the highest benefit-cost ratio. However, the IBCRs are sufficient to make the 1 in 100 year option preferred in any case.

The final two PARs appeared to be justifying a pre-determined decision. The first raised questions about the way that the options for appraisal were determined, with particular question marks over the approach to screening. The second considered only one standard of protection.

Table 11.4 summarises the problems related to use of the decision rule. The significance of each problem is also indicated in terms of how it affects the approach being used and its influence on the outcome of the appraisal. The table draws in evidence from consultation and the review of Project Appraisal Reports and the existing set of FCERM guidance.

**Table 11.4 What is the problem?**

Problem	Significance in terms of ...	
	Approach used	Appraisal outcome
The factors behind the decision rule are not always being assessed correctly	High	High
The most sustainable options are not being identified – not just through the decision rule, but through the whole appraisal process	High	High

Table 11.4 shows that the problems are not with the decision rule but with the appraisal process as a whole. Common sense usually prevails such that justifications are made for the most appropriate option based on the economic appraisal. However, the lack of consideration of all the benefits means that the most sustainable solutions are not being identified. There is a drive to providing

greater and greater standards of protection without full consideration of the environmental and social impacts. Even where an Environmental Impact Assessment has been undertaken, it is rare for the findings to have any influence on the decision other than in terms of mitigation measures.

The next step is to identify the causes of the problem, in order to determine if the problem can be solved by changes to the guidance or requires other changes to be made.

### **What are the causes of the problem?**

Table 11.5 sets out the cause of each problem identified in Table 11.4 as having an effect on the option being selected. This draws on evidence from consultation, in particular the workshops, and the review of PARs. The table provides an indication of the extent that each cause is driving the problem.

**Table 11.5 What are the causes of the problem?**

<b>Problem</b>	<b>Causing problem</b>	<b>Influence on problem</b>
The factors behind the decision rule are not always being assessed correctly	Linked to all of the causes of the problems in Sections 3, 4, 5, 6, 7, 8, 9 and 10 (e.g. inclusion of all significant impacts, assessment of non-structural solutions, undertaking sensitivity analysis, etc.)	High
The most sustainable options are not being identified – not just through the decision rule, but through the whole appraisal process	Again linked to all of the causes of problems identified previously, particularly the lack of information on the environmental and social impacts of the options	High

Table 11.5 shows that the causes of problems at the decision-making stage are, not surprisingly, linked to all of the previous stages of the appraisal. This begins with the (non) identification of the project objectives and definition of the baseline that is often accompanied by reasons why it is not appropriate. A wide range of options is usually considered at the outset but screening of options often removes many of the non-structural and/or innovative solutions without comparing the potential environmental and social benefits they may offer. Further problems are introduced when the benefits are being assessed, with these only rarely looking beyond what can be easily monetised. The sensitivity analysis is often used mechanically without reference to uncertainty in key assumptions such that the robustness of one option over another is not tested. Finally, the option choice is made using the decision rule which requires some confidence in the appraisal that precedes it. Fortunately, the review of PARs has shown that there is not any one PAR that has all of these problems; indeed, most PARs do provide information showing that the approaches used are correct. This suggests that the guidance is only one of the problems leading to difficulties with the appraisal process but that there are countless others too – time, resources, skills, limitations on data, uncertainty in data, difficulty of measuring some benefit types, difficulty of bringing non-money benefits into

appraisals, organisational inertia and human nature of wanting to provide/justify the best standard possible for the people living in their project area.

This implies that significant changes are required when, in fact, many of the principles of the appraisal process and the current guidance are correct and appropriate. The challenge is how to incorporate the growing need for greater transparency and accountability without requiring even more detail than is already included in appraisals and PARs.

The next step is to consider what solutions are required to tackle the causes of the problems.

**What are the solutions?**

Table 11.6 sets out potential solutions for each cause and each problem. Some of the causes require more than one solution, or have alternative solutions. For each solution, action that can be taken is described with the ease of implementation also given (ranging from easy to difficult). Where possible, the solutions are linked to existing process or appraisals. Evidence of the solutions is drawn from consultation, and from the review of guidance documents and appraisal processes used in other fields. The review of PARs is also used where one (or more) PARs have included impacts that could not be easily valued, as these suggest that approaches are already available that could reduce or remove the problems.

Table 11.6 shows that there are possible solutions to all of the causes of the problems. Many of these solutions require other actions to be put into place such that the changes will take time. The key is that the main principles are already in place in the guidance and in the Treasury Green Book. The main issue is that there is a need for greater transparency and thinking along new, sustainable lines, but without further increasing the time required for appraisal. This is unlikely to be possible through quick fix solutions or minor changes to the guidance documents.

**Table 11.6 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
The factors behind the decision rule are not always being assessed correctly - linked to all of the causes of the problems in Sections 3, 4, 5, 6, 7, 8, 9 and 10 (e.g. inclusion of all significant impacts, assessment of non-structural solutions, undertaking sensitivity analysis, etc.)	There are no quick fix solutions. The guidance needs to be significantly restructured and the appraisal process has to be based on risk and uncertainty if it is to include all of the required factors without taking even more time and effort	Needs for refocusing of effort based on same principles but from a risk and uncertainty perspective	Difficult – major changes are required, although the basic principles are likely to remain

**Table 11.6 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
The most sustainable options are not being identified – not just through the decision rule, but through the whole appraisal process - again linked to all of the causes of problems identified previously, particularly the lack of information on the environmental and social impacts of the options	There is a need to move to a mindset based on providing flood risk management but also on providing best solutions from all perspectives (local stakeholders, Environment Agency, Treasury, other tax payers, etc.)	Need for guidance and appraisal to help people to see the advantages of moving to a new perspective, but guidance cannot achieve this alone	Difficult - major changes are required, although the basic principles are likely to remain

## **11.4 Is the performance of the defence systems properly assessed?**

### **What is the problem?**

The review of PARs showed that a lot of effort is put into assessing the engineering side of the appraisal process. Many of the sections on benefits concentrate on breach scenarios, size of the breach and condition of the defences.

In terms of the future performance of defences, it is very rare to see discussion on the likely failure of a defence under different flood conditions or how/whether the standard provided may change in the future. Some consideration of changes in the future to standards is given in terms of climate change, however.

It is also rare to see discussion of the different performances of different types of defences, e.g. earth embankments versus concrete walls. Some of this work does go on at an early stage as different types of defences are often screened out. Where reasons are given, this can be due to a range of factors including technical feasibility, and environmental and social issues such as aesthetics or amenity.

There is also little discussion of the likely benefits of maintenance, i.e. how the inclusion of maintenance helps to maintain the standard of protection or the cohesion of the defences. Including options with and without maintenance would mean there is a requirement to consider uncertainty in terms of defence performance, which does not appear to be currently considered in any great detail (if at all) in the appraisal process.

Table 11.7 summarises the problems related to the performance of the defence systems. The significance of each problem is also indicated in terms of how it affects the approach being used and its influence on the outcome of the appraisal. The table draws in evidence from consultation and the review of Project Appraisal Reports and the existing set of FCERM guidance.

**Table 11.7 What is the problem?**

Problem	Significance in terms of ...	
	Approach used	Appraisal outcome
Little consideration is given to the performance of the defence other than in its design (the risk register tends to consider risks to costs during construction)	High	Medium
There is no discussion on the benefits provided by undertaking maintenance	Medium	Medium

Table 11.7 shows that many of the most significant problems appear to be related to investigating information used to determine how a proposed option may operate in practice. There seems to be a tendency to accept information on likely performance without considering how uncertainty in the information may affect the standard of defence provided or the way that the defence behaves under extreme conditions.

The next step is to identify the causes of the problem, in order to determine if the problem can be solved by changes to the guidance or requires other changes to be made.

### **What are the causes of the problem?**

Table 11.8 sets out the cause of each problem identified in Table 11.7 as having an effect on whether the performance of the defence systems is properly assessed. This draws on evidence from consultation, in particular the workshops. The table provides an indication of the extent that each cause is driving the problem.

**Table 11.8 What are the causes of the problem?**

Problem	Causing problem	Influence on problem
Little consideration is given to the performance of the defence other than in its design (the risk register tends to consider risks to costs during construction)	There is little consideration of uncertainty in most of the elements in the project appraisal (e.g. depth-damage data). This is probably as much to do with time and information on the uncertainty of particular data as with the guidance	High
There is no discussion on the benefits provided by undertaking maintenance	There is no guidance on or suggestion to investigate the role of maintenance in performance of defences once constructed	High

Table 11.8 shows that the main causes of the problem may not be directly linked to guidance, although there is little guidance on how to assess future performance of defences, such as through use of decision trees. Similarly, there is little knowledge on how particular events may affect specific defence types, except maybe through fragility curves.

The next step is to consider what solutions are required to tackle the causes of the problems.

### **What are the solutions?**

Table 11.9 sets out potential solutions for each cause and each problem. Some of the causes require more than one solution, or have alternative solutions. For each solution, action that can be taken is described with the ease of implementation also given (ranging from easy to difficult). Where possible, the solutions are linked to existing process or appraisals. Evidence of the solutions is drawn from consultation, and from the review of guidance documents and appraisal processes used in other fields. The review of PARs is also used where one (or more) PARs have included impacts that could not be easily valued, as these suggest that approaches are already available that could reduce or remove the problems.

Table 11.9 shows that there are possible solutions to all of the causes of the problems. Many of these solutions require other actions to be put into place such that the changes will take time.

There is no easy solution to improving the assessment of the future performance of defences. There is little information available to allow such work to be undertaken, although probabilities could be taken into account through the use of decision trees. Any increased requirement to include predictions (or similar) of future performance will need to avoid raising issues of potential liability. Also, the people living near to defences need to be considered. There would need to be very clear communication of what the predictions of future defence performance mean to them, what changes may occur and how likely they are. This may require a significant change in perception, as any failure of defences even under the most extreme conditions (and above the design standard) is seen as a failure. Providing appraisals that attempt to quantify the potential for failure may therefore lead to more precautionary approaches, with cost implications.

## **11.5 Are all significant benefits and costs taken into account in the decision process?**

### **What is the problem?**

Most of the PARs follow the decision rule closely when determining the preferred option. Some do discuss other benefits and issues where they are looking to justify an alternative option to the one that is economically justified. However, as discussed in Section 8, it is clear that there may be many other benefit types that are not taken into consideration at the decision-making stage. These are not just the environmental and social issues that are not usually assessed, but also some of the impacts that can be given in money terms: emergency services, health and stress, recreation. Furthermore, impacts such as loss of life or risk of injury are not currently included.

**Table 11.9 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
There is little consideration of uncertainty in most of the elements in the project appraisal (e.g. depth-damage data). This is probably as much to do with time and information on the uncertainty of particular data as with the guidance	Need for greater transparency in the appraisals in terms of uncertainty. It would be preferable to report uncertainty associated with the likely performance of defences under particular events but there are concerns surrounding stakeholder confidence, where flooding under any conditions is often seen as a failure	Needs more information on uncertainty, not just through the appraisal, but wider in terms of engineering aspects. Also, the perception that any flooding is a 'failure' may need to be challenged or inclusion of information on uncertainty could cause stress and worry to people living near defences	Difficult – this requires changes to be made outside the control of flood risk management. It also requires good communication of risk to stakeholders, which is known to be difficult but decision trees could be used to assess the probability that different events would affect defence performance
There is no guidance on or suggestion to investigate the role of maintenance in performance of defences once constructed	Uncertainty in terms of the likely performance of defences with and without maintenance would make it very difficult to assess the likely benefits of maintenance with any confidence. However, expert judgement could be applied to discuss the role of maintenance in terms of future life and condition of defences in qualitative terms	Need for the risk register to look further ahead than just the construction phase and to recognise that there are risks that the defence may not perform as expected if certain changes to key assumptions occur	Difficult – raises issue of liability and precautionarity – if a risk is identified, should action be taken to mitigate for it?

There is often no consideration of the likely significance of benefits before determining whether to assess them. However, the range of benefits considered is usually quite narrow, limited to property damages, traffic disruption and sometimes recreation. Therefore, the non-assessment of a particular benefit type is not an indication that it is not significant.

The decision rule itself does not explicitly allow for non-monetised benefits to be included as it refers to economic indicators such as the benefit-cost ratio and incremental benefit-cost ratio. However, while it does not specifically include them it also does not specifically exclude them. For example, the implied value of any non-monetised benefits could be considered when deciding whether the BCR or IBCR is sufficient to exceed the given thresholds. There is no guidance on how/where to do this though.

Similarly, having a decision-making process that follows a set rule or process means that there is less incentive to verify that the option selected is the one

that best fits the objectives. However, both the SMP and CFMP are objective-led appraisal processes such that this only applies to strategies and schemes.

Table 11.10 summarises the problems related to whether all significant costs and benefits are taken into account when applying the decision rule. The significance of each problem is also indicated in terms of how it affects the approach being used and its influence on the outcome of the appraisal. The table draws in evidence from consultation and the review of Project Appraisal Reports and the existing set of FCERM guidance.

**Table 11.10 What is the problem?**

Problem	Significance in terms of ...	
	Approach used	Appraisal outcome
No explicit consideration of non-monetised costs and benefits (see also Section 8)	High	High
There is no explicit requirement to scope a wide range of costs and benefits before assessing the benefits	High	High
The decision-making process does not go back to consider the project objectives when selecting a preferred option	Medium	High

Table 11.10 shows that many of the most significant problems relate to the requirements of the benefit assessment in particular. Although the guidance does not explicitly request that all significant impacts are taken into account when selecting the preferred option (where non-significant impacts would have been screened out early on in the appraisal process), it does highlight that information other than the economics (BCR, IBCR, etc.) can be used in decision-making. However, decisions still appear to be based almost entirely on the results of the economic assessment and from following the decision rule.

The next step is to identify the causes of the problem, in order to determine if the problem can be solved by changes to the guidance or requires other changes to be made.

### **What are the causes of the problem?**

Table 11.11 sets out the cause of each problem identified in Table 11.10 as having an effect on whether all significant costs and benefits are taken into account when applying the decision rule. This draws on evidence from consultation, in particular the workshops, and the review of PARs. The table provides an indication of the extent to which each cause is driving the problem.

**Table 11.11 What are the causes of the problem?**

<b>Problem</b>	<b>Causing problem</b>	<b>Influence on problem</b>
No explicit consideration of non-monetised costs and benefits (see also Section 8)	Decision rule does not include explicit reference to non-monetised costs and benefits, hence, these tend to be overlooked	High
There is no explicit requirement to scope a wide range of costs and benefits before assessing the benefits	No guidance on the type of impacts that could be considered (particularly environmental and social) (see Section 8)	High
The decision-making process does not go back to consider the project objectives when selecting a preferred option	Decision-making process follows decision-rule, thus there is no requirement to consider objectives (except in SMP and CFMP)	High

The main cause of the problem, as given in Table 11.11 is the terminology used in the decision rule. This does not explicitly include the need to consider either the objectives of the project or the non-monetised costs and benefits when making a decision. The lack of reference to these areas means that appraisers are not spending time (which is already at a premium) on assessing aspects that do not form part of the decision-making process.

The next step is to consider what solutions are required to tackle the causes of the problems.

### **What are the solutions?**

Table 11.12 sets out potential solutions for each cause and each problem. Some of the causes require more than one solution, or have alternative solutions. For each solution, action that can be taken is described with the ease of implementation also given (ranging from easy to difficult). Where possible, the solutions are linked to existing process or appraisals. Evidence of the solutions is drawn from consultation, and from the review of guidance documents and appraisal processes used in other fields.

Table 11.12 shows that there are possible solutions to all of the causes of the problems. Many of these solutions require other actions to be put into place such that the changes will take time.

The approach to using the decision rule could be improved by amending the wording of the rule such that the implied value of non-monetised costs and benefits can be taken into account when determining if the threshold BCR or IBCR has been exceeded. This could be done very simply by modifying the reading to 'does the next highest option have an incremental benefit-cost ratio robustly  $>1$ , taking into consideration any non-monetised benefits and dis-benefits'. This will need to be supported by guidance explaining what this means and how to judge whether the implied value is likely to be sufficient to push the IBCR over the threshold. This is likely to be difficult without a structured form (e.g. AST) by which to assess the non-monetary benefits (and

dis-benefits) of each option. This will put in place the approach to allow non-monetary benefits to be taken into account during decision-making.

The need to refer back to the project objectives once a preferred option has been identified needs to be emphasised. This should be compared against each objective. Where the preferred option does not fully meet the objective, consideration should be given to undertaking an iteration. This would involve looking at how the option could be amended such that it meets more of the objectives. Changes in costs and benefits would have to be considered and the new option would have to be assessed against the other options using the decision rule (with the new option replacing the old option). If the new option performs as well (or better) using the decision-rule, it would be selected as the preferred option. Further iterations against the objectives could be undertaken as required. This will put into place an approach towards optimisation and should also help improve sustainability (providing the objectives include consideration of sustainability).

However, both of these solutions require more time to be spent on the appraisal and a more flexible approach to be taken. Further discussion on how to improve decision-making such that the best solution can be identified is discussed in Section 11.6.

**Table 11.12 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
Decision rule does not include explicit reference to non-monetised costs and benefits, hence, these tend to be overlooked	Needs to be explanation and/or revision of decision rule to make it clear that the implied value of any non-monetised benefits could be considered when determining if the threshold BCR or IBCR is exceeded	Requires supplementary guidance note with examples and revised wording of decision rule	Easy – requires slight modifications to existing rule
No guidance on the type of impacts that could be considered (particularly environmental and social) (see Section 8)	Linked to solutions in Section 8, particularly the use of ASTs to encourage consistent, comprehensive consideration of a wide range of impacts from the outset	Use of AST (see Section 8 for more detailed discussion)	Easy – ASTs already developed

**Table 11.12 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
Decision-making process follows decision-rule, thus there is no requirement to consider objectives (except in SMP and CFMP)	Need to encourage appraisers to compare the option selected by using the decision rule with the project objectives to better take into account sustainability issues (but see also Section 11.6)	Requires explicit link back to objectives once option has been selected, but this should form a decision-making point in itself in identifying if the option needs to be modified to better meet the objectives (iteration), which will require more time	Difficult – more time would be required and ability/ willingness to go back through appraisal amending the option to maximise the extent to which it meets the objectives

## **11.6 Are there better ways in which significant costs and benefits could be taken into account in decision-making?**

### **What is the problem?**

Section 11.5 sets out the problems with the current approach based on the decision rule. This has effectively driven the appraisal towards one where those costs and benefits that can be presented in money terms are the only ones that are assessed. Although the guidance documents do refer to the potential importance of non-monetised costs and benefits, there is no formal way of taking them into account during decision-making. Therefore, with the current time and resource pressures, it is not surprising that the focus is on the monetised elements of the appraisal process.

This Section focuses on ways that the appraisal process could be modified to take better account of the significant costs and benefits (i.e. those costs and benefits that affect the selection of the preferred option and where insignificant costs and benefits are those that have limited impact on the overall costs and benefits and would not affect the decision that is being made). It draws heavily on evidence from appraisal processes used in other fields.

Table 11.13 summarises the problems related to taking costs and benefits into account in decision-making. The significance of each problem is also indicated in terms of how it affects the approach being used and its influence on the outcome of the appraisal.

**Table 11.13 What is the problem?**

Problem	Significance in terms of ...	
	Approach used	Appraisal outcome
The decision rule means that the focus is on monetised costs and benefits	High	High

The next step is to identify the causes of the problem, in order to determine if the problem can be solved by changes to the guidance or requires other changes to be made.

### **What are the causes of the problem?**

Table 11.14 sets out the cause of each problem identified in Table 11.13 as having an effect on whether impacts that cannot be valued in money terms are included or not. This draws on evidence from consultation, in particular the workshops. The table provides an indication of the extent that each cause is driving the problem.

**Table 11.14 What are the causes of the problem?**

Problem	Causing problem	Influence on problem
The decision rule means that the focus is on monetised costs and benefits	The appraisal process is too focused on comparing options in a way that allows the decision rule to be applied	High
	There is no emphasis in the current approach on learning through the appraisal and modifying options so that the benefits are maximised and the costs (dis-benefits or damages) are minimised	High
	Time constraints mean that there is little opportunity for iterations within the appraisal process, which links back to use of the appraisal process for comparing options	High

Table 11.14 shows that the main causes of the problem are linked, with time constraints minimising the extent to which iterations are undertaken, but with the current approach (and guidance) not emphasising the need for iterations. As a result, no iterations are undertaken. There is also a focus on the monetised costs and benefits such that the most sustainable option cannot always be determined. Thus, the best solution (i.e. least-cost in terms of sustainability) cannot be easily identified.

The next step is to consider what solutions are required to tackle the causes of the problems.

## What are the solutions?

Table 11.15 sets out potential solutions for each cause and each problem. Some of the causes require more than one solution, or have alternative solutions. For each solution, action that can be taken is described with the ease of implementation also given (ranging from easy to difficult). Where possible, the solutions are linked to existing process or appraisals. Evidence of the solutions is drawn from consultation, and from the review of guidance documents and appraisal processes used in other fields.

Table 11.15 shows that there are possible solutions to all of the causes of the problems. Many of these solutions require other actions to be put into place such that the changes will take time. The key to taking more of the significant costs and benefits into account is to develop the appraisal process so it encourages consideration of a wide range of potential costs and benefits at the outset. This will allow the appraisal to focus on the significant costs and benefits (i.e. those that are of sufficient magnitude or importance to affect the decision), which could then be quantified and expressed in money terms (where relevant or appropriate). Such a change will only occur where the decision-making process requires non-monetary costs and benefits to be considered. The decision-making process needs to be structured around a drive to identify the best solution to meet the project aims and objectives.

**Table 11.15 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
The appraisal process is too focused on comparing options in a way that allows the decision rule to be applied	Need for a refocusing of the appraisal process to emphasise need for learning and moving towards the best solution, where this may be a combination of the best bits of a number of options	Needs revision of appraisal process, guidance and approaches used	Difficult – needs a lot of changes to be put in place (see Section 4)
There is no emphasis in the current approach on learning through the appraisal and modifying options so that the benefits are maximised and the costs (dis-benefits or damages) are minimised	Need to move towards an approach which takes greater account of the need to meet the project objectives, where these need to include social, environmental and economic objectives	Needs revision of appraisal process, with formal step that involves consideration of project objectives and iteration to provide a solution that best meets the objectives	Difficult – SMP and CFMP are objective-based, as are many other appraisal processes in other fields, but requires change in process and approaches

**Table 11.15 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
Time constraints mean that there is little opportunity for iterations within the appraisal process, which links back to use of the appraisal process for comparing options	Need to revise and streamline the appraisal process such that it is driven by risk and uncertainty. This will require iterations where it is difficult to determine a proposed option	Needs revision of the appraisal process to include iteration as required to allow for learning	Difficult – requires a lot of changes to be made

## 11.7 How well do existing appraisals focus on issues that are most important for the decision being made?

### What is the problem?

The review of PARs has shown that, in many cases, the significance of issues is not taken into consideration before undertaking the assessment of benefits. Furthermore, this generally only includes property damages such that other issues that may be important are not being considered. For example, the PARs describe, in the problem, some of the key characteristics of the area. There is one PAR which describes the importance of tourism to the area, others discuss the number of heritage sites and/or listed buildings. It is rare, however, for such assets to be mentioned again; they are only very rarely included in the benefits (only two PARs include heritage/listed buildings in the monetised impacts and five discuss them as non-monetised benefits) and almost never discussed when selecting the preferred option.

The evidence from the review of PARs suggests that the appraisal process has become somewhat mechanical. Benefits are estimated by taking the depth-damage data from the MCM and multiplying them by flood depths predicted through modelling. These are then input into the FCDPAG3 spreadsheets (or similar) with the costs to provide the BCR and IBCR which are used with the decision rule to identify the preferred option. While this is the process suggested by the guidance, there is a lack of questioning of the data and of the options such that the appraisal process is not being used to learn about what may be the best solution.

Table 11.16 summarises the problems associated with making a decision. The significance of each problem is also indicated in terms of how it affects the approach being used and its influence on the outcome of the appraisal. The table draws in evidence from consultation and the review of Project Appraisal Reports and the existing set of FCERM guidance.

**Table 11.16 What is the problem?**

Problem	Significance in terms of ...	
	Approach used	Appraisal outcome
There is no assessment of what the significant issues may be at the outset of the appraisal, thus, there is no way of knowing if all significant impacts have been included	High	High
The approach has become somewhat mechanical	High	Medium

Table 11.16 shows that there are impacts on both the approach used and the outcome of the appraisals since it is often not known whether all of the significant issues have been included in the appraisal. Thus, the decision is often based on only the readily available information with no scoping of wider issues.

The next step is to identify the causes of the problem, in order to determine if the problem can be solved by changes to the guidance or requires other changes to be made.

### **What are the causes of the problem?**

Table 11.17 sets out the cause of each problem identified in Table 11.16 as having an effect on how well existing appraisals focus on issues that are most important for the decision being made. This draws on evidence from consultation, in particular the workshops. The table provides an indication of the extent that each cause is driving the problem.

Table 11.17 shows that the main causes of the problems relate not only to guidance but also to wider issues such as time, skills and the requirements of approvers. Guidance issues relate mainly to a lack of detail on the range of impacts that need to be considered.

The next step is to consider what solutions are required to tackle the causes of the problems.

**Table 11.17 What are the causes of the problem?**

Problem	Causing problem	Influence on problem
There is no assessment of what the significant issues may be at the outset of the appraisal, thus, there is no way of knowing if all significant impacts have been included	Although FCDPAG3 encourages consideration of a wide range of impacts, it does not specify what sort of impacts should be considered or what 'significant' means. Therefore, there is a lack of guidance on the issues that should be considered	High

**Table 11.17 What are the causes of the problem?**

<b>Problem</b>	<b>Causing problem</b>	<b>Influence on problem</b>
The approach has become somewhat mechanical	Relates to issues of time and skills, but also the requirements specified by project managers and approvers, and the desire of appraisers to get their scheme approved first time	High

### **What are the solutions?**

Table 11.18 sets out potential solutions for each cause and each problem. Some of the causes require more than one solution, or have alternative solutions. For each solution, action that can be taken is described with the ease of implementation also given (ranging from easy to difficult). Where possible, the solutions are linked to existing process or appraisals. Evidence of the solutions is drawn from consultation, and from the review of guidance documents and appraisal processes used in other fields.

Table 11.18 shows that there are possible solutions to all of the causes of the problems. Many of these solutions require other actions to be put into place such that the changes will take time. Inclusion of significant issues could be encouraged through the use of ASTs, as discussed in detail in Section 8. This will help ensure that a wide range of potentially significant costs and benefits are scoped at an early stage of the appraisal, making it much more likely that they will be assessed in the appraisal and taken into account during decision-making. However, this is only one step to making sure that the key influences on the decision are included when selecting the preferred option. A further step is required where the guidance (and appraisal process) are refocused to encourage appraisals to take account of significance of the issue. This, together with risk and uncertainty, will drive the level of detail to which issues are assessed and, thus, concentrate effort on those issues that are likely to have the greatest influence on the decision.

**Table 11.18 What are the solutions and how can they be implemented?**

<b>Causing problem</b>	<b>Solutions</b>	<b>Ease of implementation of solution</b>	
Although FCDPAG3 encourages consideration of a wide range of impacts, it does not specify what sort of impacts should be considered or what 'significant' means. Therefore, there is a lack of guidance on the issues that should be considered	Potential for guidance identifying the range of impacts that could be included, associated with the use of ASTs (see also Section 8)	Use of ASTs based on categories, e.g. from EIA, can help to bring together results of different strands of appraisal process	Easy – ASTs already developed for use elsewhere (e.g. FD2013)

**Table 11.18 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
Relates to issues of time and skills, but also the requirements specified by project managers and approvers, and the desire of appraisers to get their scheme approved first time	Need of change in attitude, probably alongside a change in the appraisal process that requires more judgement from appraisers on when/what to include based on significance, risk and uncertainty	Revised focus of appraisal, to one based on risk and uncertainty to determine what is included and at which level of detail	Difficult – requires a lot of other changes to be made, including to appraisal and guidance, and needs change in attitudes

## 11.8 Overall solutions

This Section focuses on decision-making, but there are changes that need to be put into place at other points of the appraisal process such that the decision-making process is more comprehensive. This includes:

- the use of ASTs to scope out all of the costs and benefits that may be relevant (see Section 6);
- formal inclusion of screening (Section 7); and
- inclusion of scenarios and sensitivity analysis as a method for informing option appraisal and comparison, rather than an add-on at the end of the project (Section 9).

The appraisal process itself needs to begin by scoping a wide range of impacts at the outset, which can then be screened such that all the significant costs and benefits are assessed appropriately, driven by the level of uncertainty that is inherent in decision-making at different levels of detail. All of these significant issues can then be taken into account at the decision-making stage. Without wholesale changes to the appraisal process, there is a risk that any additional requirements (such as use of ASTs, a revised approach to sensitivity analysis such that it informs the whole process, etc.) will be perceived as further adding to the burden of appraisal and will either not be undertaken or will not change the appraisal process to one of learning about the options.

It is also important that the preferred option can be compared back against the project objectives, with the aim of identifying the extent to which the option meets (or does not meet) each objective. This will then indicate whether there is a need for iteration, where the selected option can be modified to increase the extent that it meets more or all of the objectives (i.e. optimisation). It is essential that the objectives cover social, environmental and economic considerations, while technical issues such as the future performance of the option are also important. This can be assessed using decision trees or described in qualitative terms where there is insufficient information on which to base quantified estimates in changes in standard provided or probability of failure under particular extreme conditions.

Communications with stakeholders on the decision being made will require greater transparency on how the appraisal has been undertaken. It will also be important to communicate the issue of risk clearly, particularly where this is included as part of the appraisal process. It is essential that people living near to the defences understand that there is a risk that the defences may fail under certain conditions. This may help to encourage the acceptance of non-structural solutions to support the structural solutions at times of extreme conditions. It is also important that people living in flood risk areas understand the risk. Care will be needed to underline that this does not mean that they are not as well protected as they were before the additional information was made available.

Also essential is ensuring that the revised guidance is accessible to stakeholders as well as practitioners and approvers. This means it needs to be openly available (e.g. Internet based) but it also needs to be understandable and in a form that a local resident, councillor, etc. can understand why the process is being undertaken and how the results are determined. This needs to be coupled with transparent appraisal reports that explain and justify all decisions and assumptions made such that there is confidence and trust of both practitioners and approvers by the local stakeholders. The risks of not providing clear and accessible guidance and appraisal reports is that stakeholders do not feel involved in the decision or do not believe the best solution has been identified. This could result in expensive and long-term discussions and appeals with consequent impacts on the reputation of the Environment Agency, Defra and the consultants.



## **12. Residual risks and extreme events**

### **12.1 What does the current guidance say?**

#### ***Residual Risk***

Residual risk is defined in the glossary in FCDPAG2 as: 'The risk which remains after risk management and mitigation. It may include, for example, risk due to very severe (above design standard) storms, or risks from unforeseen hazards'.

Residual risks identified through risk management is mentioned in FCDPAGs 1 and 3 and how this is incorporated in appraisals in FCDPAG4 (S3.2.6, & Example A) but not in any detail.

Residual risks are identified as a key output for CFMPs (Vol I Box 1) and also to be included in the description of the preferred option as described in the Project Appraisal Report Guidance (S2.7), where the nature and scale and how the risk will be managed must be covered.

#### ***Extreme Events***

There is no guidance in any of the guidance documents defining what an extreme event is but most include the need to take the effects of them into account. Some state that an extreme event is a 1 in 100 year event or larger (e.g. CFMP Appendix B). FCDPAG3 points out the need to assess the impact of extreme events where these are events greater than those for which the level of protection has been designed.

### **12.2 Are impacts of extreme events adequately assessed?**

#### **What is the problem?**

The problems associated with extreme events relate partly to a lack of clarity in the guidance on how to account for such conditions and the need for projects to look wider than just the immediate area at risk from the 1 in 100 or 1 in 200 year events. However, there are also practical problems with extreme events including constraints on design and the costs of precautionary approaches where defences are built to not fail, etc.

Table 12.1 summarises the problems related to the assessment of extreme events. The significance of each problem is also indicated in terms of how it affects the approach being used and its influence on the outcome of the appraisal. The table draws in evidence from consultation and the review of Project Appraisal Reports and the existing set of FCERM guidance.

**Table 12.1 What is the problem?**

Problem	Significance in terms of ...	
	Approach used	Appraisal outcome
There is a lack of clarity/weight on extreme events – consideration is not as explicit as it could be	High	Medium
Practical issues and uncertainty of extreme events	High	Medium
Extreme events affect a wider area than is often being considered in a PAR	High	Medium

The next step is to identify the causes of the problem, in order to determine if the problem can be solved by changes to the guidance or requires other changes to be made.

### What are the causes of the problem?

Table 12.2 sets out the cause of each problem identified in Table 12.1 as having an effect on whether impacts of extreme events are adequately assessed or not. This draws on evidence from consultation, in particular the workshops. The table provides an indication of the extent that each cause is driving the problem.

**Table 12.2 What are the causes of the problem?**

Problem	Causing problem	Influence on problem
There is a lack of clarity/weight on extreme events – consideration is not as explicit as it could be	Guidance does not specify what should be done, although it does say that extreme events should be thought about	High
	It is unclear how much time and effort should be spent thinking about extreme events, when there is little data available on which to predict the impacts	High
	Extreme events contribute little to the Average Annual Damages (AAD) therefore tend to be ignored	High
Practical issues and uncertainty of extreme events	It is not practically possible to design against extreme events	Medium
	Extreme events are also difficult to model due to lack of data for calibration	
Extreme events affect a wider area than is often being considered in a PAR	Projects focus on their own areas, therefore, do not consider wider implications of a major event	High

The main causes of the problems, as shown in Table 12.2, are linked to the current limited coverage of the issue of extreme events in the guidance and the tendency for PARs to focus in on the area they are considering.

The next step is to consider what solutions are required to tackle the causes of the problems.

### What are the solutions?

Table 12.3 sets out potential solutions for each cause and each problem. Some of the causes require more than one solution, or have alternative solutions. For each solution, action that can be taken is described with the ease of implementation also given (ranging from easy to difficult). Where possible, the solutions are linked to existing process or appraisals. Evidence of the solutions is drawn from consultation, and from the review of guidance documents and appraisal processes used in other fields.

Table 12.3 shows that there are possible solutions to all of the causes of the problems. Many of these solutions require other actions to be put into place such that the changes will take time.

The guidance does not cover the potential effects of extreme events in much detail. Therefore, it would be helpful to provide some additional guidance on approaches that could be used to incorporate some of the effects. This may require the use of ASTs to ensure that social impacts can be fully captured (as these may be more significantly affected under larger events than is reflected by only assessing the additional property damages). However, it is essential that the appraisal includes consideration of the probability of such events when determining how much time to spend determining the impacts given their low probability. It is also important that the impacts of the extreme event do not overwhelm the impacts on lower probability but potentially damaging events. Where the effects of extreme events are predicted to be severe, consideration should be given to iteration of the option appraisal, combining the preferred option with non-structural solutions and identifying potential mitigation measures. This may also require the appraisal to inform the design process, to make the defence more resistant to particular conditions (although the costs and benefits of all additional measures will have to be taken into account to ensure that they are justified).

**Table 12.3 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
Guidance does not specify what should be done, although it does say that extreme events should be thought about	The guidance needs to be clear about how extreme events should be considered, including the need to mitigate for the effects of extreme events	Need for clear definitions in guidance and explanation of what to do and when	Moderate – will need to avoid becoming too prescriptive as issues will vary widely between projects

**Table 12.3 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
<p>It is unclear how much time and effort should be spent thinking about extreme events, when there is little data available on which to predict the impacts</p>	<p>The guidance needs to specify the need to undertake appraisals from the perspective of risk and uncertainty. Thus, for those areas and defence types that may be more susceptible to extreme events more time could be spent considering the impacts</p>	<p>Need for refocusing of guidance from risk and uncertainty perspective, to allow appraisers to exercise judgement about how far to appraise the effects of extreme events</p>	<p>Moderate to difficult – requires a lot of changes to be made to the guidance to the attitudes and approaches of those involved in project appraisal</p>
<p>Extreme events contribute little to the Average Annual Damages (AAD) therefore tend to be ignored</p>	<p>Need to extend the benefits being considered to beyond those that can be easily monetised. Under extreme events, it is likely that the greatest effects will be in social terms</p>	<p>Need for inclusion of wider range of impacts to pick up the full impacts of extreme events. This will require wider scoping and assessment of benefits (see also Section 8)</p>	<p>Moderate – use of ASTs to scope impacts wider but will need clear thinking on how to incorporate the effects of extreme events without swamping other effects which may have a higher probability</p>
<p>It is not practically possible to design against extreme events</p>	<p>Need to focus on potential mitigation, adaptation and uncertainty rather than designing to withstand all possible events. It will also be important to emphasise the role that non-structural solutions can play in helping to minimise the effects of extreme events</p>	<p>Could be combined with approaches to looking at effects of scenarios and climate change to assess type of adaptability that may be required</p>	<p>Moderate – requires feedback from the appraisal to design in an iterative manner and understanding of uncertainty</p>
<p>Projects focus on their own areas, therefore, do not consider wider implications of a major event</p>	<p>Need for consideration of extreme events at the plan and strategy scale where the areas under consideration are larger. The results can then filter down to schemes to ensure that the possible impacts of extreme events are not lost</p>	<p>Need for close links between different levels of appraisal and use of information from appraisals undertaken for SMP/CFMP and Strategy</p>	<p>Easy to moderate – this is already done to a large extent, but requires information to be easily accessible and taken into account in the schemes</p>

## 12.3 How well is residual risk understood and communicated?

### What is the problem?

Forty-three of the 67 PARs reviewed include some description of residual risk, although this is often only in terms of residual damages included in the FCDPAG3 spreadsheets. The risk registers tend to focus mainly on project costs during construction, and often the issue of 'risk' within the PARs is only discussed in terms of costs. The findings of the review of PARs suggest that residual risk is not communicated very well (if at all) and it only seems to be understood in the context of costs.

Table 12.4 summarises the problems related to the communication of residual risk. The significance of each problem is also indicated in terms of how it affects the approach being used and its influence on the outcome of the appraisal. The table draws in evidence from consultation and the review of PARs and the existing set of FCERM guidance.

**Table 12.4 What is the problem?**

Problem	Significance in terms of ...	
	Approach used	Appraisal outcome
Residual risk is not communicated well	High	High
Residual risk is only considered in terms of costs or as it is calculated in the FCDPAG3 spreadsheets	High	Medium

The next step is to identify the causes of the problem, in order to determine if the problem can be solved by changes to the guidance or requires other changes to be made.

### What are the causes of the problem?

Table 12.5 sets out the cause of each problem identified in Table 12.4 as having an effect on whether impacts that cannot be valued in money terms are included or not. This draws on evidence from consultation, in particular the workshops. The table provides an indication of the extent that each cause is driving the problem.

**Table 12.5 What are the causes of the problem?**

Problem	Causing problem	Influence on problem
Residual risk is not communicated well	Little coverage of residual risk in guidance, particularly in terms of how to assess and communicate it	High
Residual risk is only considered in terms of costs or as it is calculated in the FCDPAG3 spreadsheets	Linked to above, plus lack of understanding/consideration of uncertainty generally (see also Section 9)	High

Section 12.1 highlights that the guidance only discusses residual risk very briefly and does not provide any indication of how to include it (except for CFMPs). If residual risk is not being fully considered in the appraisal process, it becomes impossible to communicate it to stakeholders.

The next step is to consider what solutions are required to tackle the causes of the problems.

**What are the solutions?**

Table 12.6 sets out potential solutions for each cause and each problem. Some of the causes require more than one solution, or have alternative solutions. For each solution, action that can be taken is described with the ease of implementation also given (ranging from easy to difficult). Where possible, the solutions are linked to existing process or appraisals. Evidence of the solutions is drawn from consultation, and from the review of guidance documents and appraisal processes used in other fields.

Table 12.6 shows that there are possible solutions to all of the causes of the problems. Many of these solutions require other actions to be put into place such that the changes will take time.

The solutions link to ensuring that the full range of impacts of those events above the design standard is understood. This is likely to be particularly important in terms of social impacts. Communication of residual risk to stakeholders also has to be done in a way that does not cause any additional concern. The first solution can be addressed by the use of ASTs, although these will focus mainly on impacts occurring under each option, thus, it may be necessary to include a specific requirement to include residual risks.

**Table 12.6 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
Little coverage of residual risk in guidance, particularly in terms of how to assess and communicate it	Need to identify importance of residual risk (will relate to the option being implemented) and what it means to people living in the flood risk area	Need for mechanism to ensure residual risk is understood by assessing a wider range of impacts (particularly social) and can be communicated to stakeholders in a way that will not result in worry about flooding	Difficult – assessment of residual risk requires consideration of more than just property damages and that this can be explained to people in a clear and appropriate manner

**Table 12.6 What are the solutions and how can they be implemented?**

Causing problem	Solutions	Ease of implementation of solution	
Linked to above, plus lack of understanding/ consideration of uncertainty generally (see also Section 9)	Need for better understanding of what residual risk means and what it represents (see also Section 12.2)	Linked to the need to ensure that the full range of impacts is assessed so the residual risk is better understood (particularly in terms of social impacts)	Moderate to difficult – need for full assessment of impacts

## 12.4 Overall solutions

Residual risks and extreme events both require a fuller range of impacts to be considered as it is likely to be social impacts that are greatest under the larger events. This needs greater scoping of impact, such as through the use of ASTs, although these may need to be extended from those proposed in other Sections of this report to ensure that the risks of above design events can be captured. However, the probability of extreme events (and uncertainty of modelling) needs to be considered when determining how much time to spend on assessing effects. This requires the appraisal process to be structured around risk and uncertainty, such that more time and effort is spent on those issues that have the greatest influence on decision-making (see also Section 11). The risk of not undertaking such changes to the appraisal process and accompanying guidance is that the option that is implemented is not able to perform as required and where residual risks have not been fully assessed and could (potentially) result in significant social impacts. This is illustrated by Carlisle, which showed the additional effects of flooding on a relatively isolated community. It is essential that lessons are learnt from such events such that future appraisals better consider the potential for significant effects of larger events (particularly those above the design standard). It is only by focusing on risk and uncertainty that such issues can be brought fully into the appraisal process without adding considerably to the time and resources required.

Communication of risks to stakeholders has to be undertaken in a way that does not cause any additional concern. This is likely to require a tailored approach to the area in question, such that guidance should provide a flexible approach allowing the project team to apply their experience and expertise. As discussed in Section 11, this highlights the importance of having an appraisal process and guidance that is understood by local stakeholders. Residents, in particular, may only need to review the guidance and/or appraisal process once, hence, they need to be able to understand what is being undertaken and why. This links through to community involvement in decision-making which is outside the remit of this project but which is an essential component if the ‘best’ solution is to be identified.



## 13. Conclusions and recommendations

Overall solutions have been included at the end of each section and provide detailed conclusions relating to that section. There are a number of common themes running through the problems and solutions.

Evidence from the review of PARs and consultation (questionnaires and workshops) shows that there are problems with the (non) identification of the project objectives and definition of the baseline that is often accompanied by reasons why it is not appropriate. A wide range of options is usually considered at the outset but screening of options often removes many of the non-structural and/or innovative solutions without comparing the potential environmental and social benefits they may offer. Further problems are introduced when the benefits are being assessed, with these only rarely looking beyond what can be easily monetised or explicitly included in the priority score. The sensitivity analysis is often used mechanically without reference to uncertainty in key assumptions such that the robustness of one option over another is not tested. Finally, the option choice is made using the decision rule which requires some confidence in the appraisal that precedes it. Furthermore, the hierarchy of the current suite of FCDPAG documents is such that, although it is perceived to run logically from PAG1 through to PAG5, this is not the case. Similarly, tools and techniques are provided in some guidance documents (e.g. FCDPAG3 (economic analysis), FCDPAG4 (risk), FCDPAG5 (environment) and the Multi-Coloured Manual and Handbook). This has resulted in duplication of areas, but also some issues that are not adequately covered leaving practitioners without a clear route to follow. Thus, practitioners have developed their own approaches based on their experience and expertise, which provides flexibility but can introduce inconsistency (e.g. in how the do-nothing baseline is assessed). However, approvers are then requiring specific approaches to be used and reported such that flexibility is lost and it is the approvers who are driving the approach and detail of an appraisal, rather than the requirements of the project itself.

The review of PARs has shown that there is not any one PAR that has all of these problems; indeed, most PARs provide information showing that the approaches used are correct. The review also showed that the appraisals were (often) not transparent, there was limited information on how impacts were considered other than property damages and although it appeared that the 'right' option was chosen there was little confidence that it was the 'best' option. Respondents to the questionnaires and attendees at the workshop also highlighted that there are wider issues. This suggests that the guidance is only one of the problems leading to difficulties with the appraisal process but there are others too – time, resources, skills, limitations on data, uncertainty in data, difficulty of measuring some benefit types, difficulty of bringing non-money benefits into appraisals, organisational inertia and human nature of wanting to provide/justify the best standard possible for the people living in their project area.

Therefore from the evidence gathered, the existing guidance, although fulfilling a need in the past, is limited in its scope especially on decision making, is not

easily updated to keep abreast of changes, and users do not find it user friendly.

Guidance related solutions proposed include:

- developing separate (but linked) guidance for Defra policy and tools and techniques used in the process. Defra and the Environment Agency have already started this;
- a change of emphasis to the appraisal process is required to provide the 'best' solution that is optimal, sustainable and adaptable (building on the initiatives in MSfW);
- there needs to be a much wider scoping and screening of all impacts at an early stage to target effort to where it is most needed so that the appraisal is efficient and effective. This will help ensure that the decision is based on the most important drivers and the appraisal is based on addressing risk and uncertainty;
- guidance should be tiered to take account of the differing needs of the different levels of appraisal and the different skills of those using the guidance. Defra and the Environment Agency are planning to explore this;
- all guidance should be easily accessible, searchable and updatable. Defra and the Environment Agency are already aiming at this, as shown by the example of this is the recent Multi-Coloured Handbook;
- the decision to invest should be at a strategic level with the implementation through schemes that are appraised against cost-effectiveness, sustainability and optimisation, with identification of which baseline (do-nothing, do-minimum, continue current practice) is most appropriate at the different levels. The implication of this for both Defra and the Environment Agency need to be investigated further; and
- there needs to be a strong understanding of the link between the appraisal and the approach to prioritisation.

'Wider solutions' proposed include:

- the wider challenge of addressing the diverse range of skills and competencies of appraisers, to ensure that they have the relevant expertise and understanding. This cannot be achieved by changes to the guidance alone. Other solutions will need to include training, mentoring and networking.

While solutions could be introduced to cover each of these areas separately, this is likely to result in an appraisal process that would take longer and cost more, which is unlikely to be acceptable. As a result, practitioners are likely to find it difficult to implement the changes and the risk is that the potential solutions would not be realised. Thus, it is proposed that the guidance is significantly restructured to address many of the issues raised. There is also the potential that good guidance, introducing the solutions proposed above, could help address some of the wider issues.

## 14. References

Bruisma F. & Vreeker R. 2004. Combined cost benefit analysis and cost effectiveness analysis for flood protection – case study of the Rhine and Meuse river basins, Chapter 6, ADVISOR Final Report, downloaded from <http://ecomman.dcea.fct.uni.pt/projects/advisor>.

BTRE 2002. Benefits of flood mitigation in Australia, Report 106, Bureau of Transport and Regional Economics, Australia.

Countryside Council for Wales *et al.* 2004. Strategic Environmental Assessment and biodiversity: A guidance for practitioners.

Defra 2001. An economic analysis to inform the review of the objectives for particles Air Quality Strategy, London.

Defra 2005. Making space for water (MSfW): taking forward the new Government strategy for flood risk management in England, London: Defra.

Defra 2006. Shoreline management plan guidance, London: Defra.

Department for Transport nd. Multi modal transport appraisal investment, London: DfT.

Department for Transport 2001. A project appraisal framework for ports, London: DfT.

Department for Transport 2002. Economic assessment of road maintenance: QUADRO manual, London: DfT.

Department for Transport 2003. Guidance on Preparing an Economic Impact Report, prepared by Steer Davies Gleave, London: DfT.

Department for Transport 2004. The COBA manual, Volume 13: Economic assessment of road schemes, London: DfT.

Department for Transport 2005. Transport Analysis Guidance (TAG), ITEA, London: DfT.

EEA 2001. Sustainable water use in Europe, part 3: extreme hydrological events: floods and droughts, Copenhagen: EEA.

Environment Agency 2004. Catchment flood management plans – volume 1 policy guidance, Environment Agency, Bristol: EA.

European Communities 2003. Technical Guidance Document (chemical risk management), JRCA-Ispra (VA), Italy.

FHRC 2005a. The benefits of flood and coastal risk management: a manual of assessment techniques (multi-coloured manual), London: Middlesex University Press.

FHRC 2005b. The benefits of flood and coastal risk management: a handbook of assessment techniques (multi-coloured handbook), London: Middlesex University Press.

HM Treasury 2003. The Green Book - appraisal and evaluation in Central Government, London: TSO.

HR Wallingford 2006. Climate change impacts and adaptation – cross-regional research programme, Project C Water for Defra/Environment Agency.

HSE 2001. Reducing risks, protecting people, HSE's decision-making process, Suffolk: HSE Books.

Institute of Public Health 2006. Health impact assessment: a short guide, Ireland.

Jonkman S.N., Brinkhuis-Jak, N., Kok M. 2004. Cost benefit analysis and flood damage mitigation in the Netherlands, HERON, **49**, No. 1, pp95-111.

MAFF 1999. FCDPAG3 Flood and coastal defence project appraisal guidance – economic appraisal, London: MAFF (now Defra).

MAFF 2000a. London: Middlesex University Press., London: MAFF (now Defra).

MAFF 2000b. FCDPAG5 Flood and coastal defence project appraisal guidance – environmental appraisal, London: MAFF (now Defra).

MAFF 2001a. FCDPAG2 Flood and coastal defence project appraisal guidance – strategic planning and appraisal, London: MAFF (now Defra).

MAFF 2001b. FCDPAG1 Flood and coastal defence project appraisal guidance - overview, London: MAFF (now Defra).

NSW Government nd. Floodplain management manual, New South Wales, Australia.

NZIER 2004. Economic impacts on New Zealand of climate change related extreme events: focus on freshwater floods, report to the New Zealand Climate Change Office, July 2004.

RPA/FHRC 2004. The appraisal of the human-related intangible impacts of flooding, R&D Technical Report FD2005/TR. London: Defra/Environment Agency.

Scottish Executive Development Department 2002. Economic assessment of road schemes in Scotland, the NESAs manual 1, Edinburgh.

Strategic Rail Authority 2003. A guide to the appraisal of support for passenger and freight rail services.

UKCIP 2003. Climate change adaptation, risk, uncertainty and decision-making.

UKCIP 2004. Strategic Environmental Assessment and biodiversity: a guidance for practitioners.

Winterscheid A. 2006. Application of scenario technique in flood risk management. In: proceedings of the IWA Conference: Innovations in coping with water and climate related risks, 25-27 September 2006, Amsterdam.



Annex 1  
Zero Based Review  
Comment on do-nothing or do-minimum baseline



## **A1.1 Introduction**

The Zero Based Review (ZBR) prepared for Defra included the following recommendation:

8. since] “do nothing” and “do minimum” are already considered as alternatives in the development of options in the current scheme appraisal system, the identification and use of the correct counterfactual should be feasible and this approach should be adopted as soon as possible.

This short paper sets out some of the arguments for and against switching to the do-minimum as a baseline as requested by Karl Hardy and David Richardson.

## **A1.2 Current Guidance**

The Green Book is not explicit in how the baseline should be set or described but does refer to options such as:

- the result if nothing is changed, or there was minimal change;
- the range of options depends on the objectives. For a major programme, a wide range should be considered before short listing for detailed appraisal. Both new and current policies, programmes and projects should be included as options; and
- the shortlist must always include the ‘do-minimum’ option.

The Green Book does not define baseline or counterfactual.

The do-nothing as the baseline for appraisals is clearly set out in the FCDPAG series and also the Project Appraisal Report Template.

FCDPAG1 also stresses the importance of the do-nothing option in assessing sustainability.

The do-nothing option as the baseline is described in FCDPAG2 (S3.2.5): *‘A realistic do-nothing scenario should be developed however inconceivable it may seem. The do-nothing option should always be considered as a potential solution, although the way it is presented to a wider audience will often need to be carefully considered. The do-nothing scenario will then form the baseline against which all other scenarios, including continuation of present practice (often the do-minimum option), should be tested in terms of economic, technical and environmental performance.*

FCDPAG3 identifies the importance of properly considering the ‘do-nothing’ option (S3.1) and states that: *‘do-nothing is always an option’*. It comments that: *‘Identifying the ‘do nothing’ option correctly is therefore critical to the analysis and needs careful consideration’* and also gives a guide to the (rare) cases where the do-minimum could be the baseline. The guidance is clear as to what the do-nothing option is and what should be included and why.

The use of the do-nothing baseline has underpinned FCERM appraisals for many years and (presumably) is used as the powers for flood and coastal management are discretionary and therefore do-nothing is a real option. However, whether this could be implemented may be open to discussion as there are arguments put forward that if do-nothing abandons existing defences or stops maintenance that had been on-going for years then those affected could have expected it to carry on. The experience of Happisburgh counteracts this as the defences have been abandoned and do-nothing (to the defences) is being implemented. The costs however, are not zero and the local authority has spent considerable time and resources at meetings, answering letters, ministerial correspondence, etc. and re-housing those whose houses have been lost to the sea.

Approaches for dealing with implementing the do-nothing option in relation to uneconomic sea defences is detailed in the paper prepared by Defra 'Maintenance of Uneconomic Sea Flood Defences: A Way Forward' (January 2004).

This paper sets out four ways forward depending on whether there is an economic justification, legal requirements to defend, uncertainty and unacceptable risks, or defences that do not fit the previous three categories. The guidance for the last case is for the Environment Agency to 'begin the process of withdrawing maintenance as soon as possible' (i.e. abandon the defences).

For Category 3 (uncertainty and unacceptable risks) the policy is for the development of an exit strategy for withdrawing maintenance (again abandoning the defences). The paper then gives options on how exit strategies could be approached (e.g. landowners may wish to take over the maintenance).

### **A1.3 The do-nothing and do-minimum baselines**

The guidance on the what constitutes the do-nothing baseline is clear and FCDPAG1 adds 'however inconceivable it may seem'. However, there were comments from the consultations undertaken for FD2019 that:

- the do-nothing option is highly uncertain;
- the do-nothing option is unrealistic, especially for urban areas; and
- the do-nothing damages are often completely false.

The move to a do-minimum baseline would not necessarily address any of these concerns for the following reasons:

- uncertain: it is difficult to define do-nothing but do-minimum is equally difficult to define (see below);
- unrealistic: there are questions over what maintenance can achieve over time with degrading defences, changing defence conditions under different maintenance regimes; and
- false: assumptions are still required about what will happen and when under a do-minimum maintenance regime and predicting the impacts is unlikely to be any easier than under do-nothing.

Using do-minimum as the baseline could add to concerns because the first question to answer would be 'what is do-minimum'. There could be a number of answers to this (list not exhaustive):

- carry on maintenance as at present;
- minimum expenditure to maintain the defence but standard will fall over time;
- maintain the asset in its built condition;
- maintain the asset for as long as is practical and then revert to do-nothing; or
- provide warnings to reduce risk and ignore condition of defence.

The move to a do-minimum baseline therefore has as many, if not more concerns, than the existing do-something baseline. In addition consultees from the FD2019 project also commented that: 'use of a do-minimum baseline would reward those who have not maintained their defences' because the benefits of doing something would (appear to) be greater.

The use of do-nothing is a convenient way of assessing the maximum possible extent of damages, is well understood and the move to a do-minimum baseline does not appear to have any real benefits to the present appraisal process. This could change if the decision to invest (do-something) is made at the strategy level, then one of the options at implementation level could be do-minimum to continue as at present or maintain current flood risk.

#### **A1.4 Savings identified in the ZBR**

The consultants preparing the ZBR have identified a non cash-releasing efficiency gain (savings?). There is no explanation as to how this has arisen from but it is assumed that it relates to who pays and the saving is to Defra? To explain this, if we take a very simple case with two options for reducing flood risk as follows:

<b>Option</b>	<b>Description</b>	<b>Cost</b>
1	Do-nothing	0
2	Maintain as at present (maintenance works)	x
3	Improve (capital project)	y

Then:

- the cost to society is y (capital project);
- the cost to the Environment Agency is y-x (maintenance at present is already committed); and
- the cost of capital grant is y-x.

The argument is because x was already committed then the additional cost of improving the defence is y-x giving a saving to the grant paying budget of x. This is identified in the ZBR report as around 5% or about £15m. However, as x was already committed expenditure there is no cost saving to society (i.e. non cash-reducing).

This clearly points to the need for the appraisal of maintenance expenditure on the same principle that capital expenditure is justified but perhaps using a modified method that is less resource intensive but without losing much of the rigour of the present system. This would lead to a much more transparent system, encourage the use of maintenance to more effectively manage (and reduce) the risk of flooding and potentially benefit the promotion of non-structural solutions.

## **A1.5 Conclusions**

The need for a baseline that is separate from the options is vital to gaining a full understanding of 'what is going on' and is not being questioned. The change from using the do-minimum baseline from the current do-nothing does not appear to have any advantages apart from a paper cost saving. The do-minimum has at least as many uncertainties as the do-nothing and as powers are permissive do-nothing is on the face of it a realistic option. The argument that do-nothing can be 'amended' to ensure that doing-something can be justified holds also for do-minimum, particularly if there is no agreement what do-minimum means. Such agreement would be very difficult to achieve as it would have to take into account all possible conditions of defence. As a result, it is likely that an agreed do-minimum baseline would almost revert back to do-nothing. This then gives additional complications where it is necessary to compare appraisals for prioritisation.

The better (and most transparent) way forward would be to keep the do-nothing option as the baseline and appraise all expenditure for flood risk management using the same methodology and not have the artificial split between maintenance and capital expenditure, which is all used to the same end. Maintenance and capital expenditure would then not exist as separate budgets but there would be one for all flood risk management. All the money (or the great majority) comes from the public purse and a consistent appraisal methodology will ensure that it is spent in the most beneficial way (i.e. the greatest reduction in risk to people and property).

Finally, it would be possible to reduce the Environment Agency maintenance budget by the amount of maintenance identified in the maintain option for capital projects constructed in any year. However, there is still a requirement to maintain the capital works therefore a maintenance budget will still be required (which could be more or less than the budget on the previous asset) giving no overall saving.



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