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SID 5 Research Project Final Report

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Project identification

1. Defra Project code: FD2018

2. Project title:
   The 'Sugden' Approach – Testing a Disaggregated Approach to Appraisal

3. Contractor organisation(s):
   Risk Solutions
   59-60 Russell Square
   London
   WC1B 4HP

4. Total Defra project costs (agreed fixed price): £ 74,673.75

5. Project: start date ..... 24 August 2005

   end date ..... Main project end date- 22 December 2006
   Variation end date - Jan/Feb 2007

6. It is Defra's intention to publish this form.
Please confirm your agreement to do so.....**YES** ☒ **NO** ☐

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Executive Summary

7. The executive summary must not exceed 2 sides in total of A4 and should be understandable to the intelligent non-scientist. It should cover the main objectives, methods and findings of the research, together with any other significant events and options for new work.

We have tested and developed the approach recommended by Professor Sugden and we endorse the principle of making clear the various sources of funds and the distribution of benefits. We have developed an appropriate table of monetised costs and benefits and a consistent Appraisal Summary Table that would bring together the material for a final multi-criteria analysis. We have developed and tested templates for their use in appraisal. We find the approach has the following advantages:

- The method provides greater transparency and more information to aid decision making.
- The approach supports both improved quality assurance of appraisals, and optimisation of option design
- It makes it clearer what has been monetised and included in the appraisal and what has not.
- It allows the benefit of schemes to individual businesses or groups of businesses to be identified and therefore may assist in negotiation of contributions from third parties.

Data is generally available to support the application of the approach and practitioners confirm that the process is unlikely to involve significantly more work. We have, however, identified a number of areas where further research, or policy input, is required. These include:

- Data issues – The recommendation to use the numeraire of market prices has implications for the FHRC MCM datasets and capping of damages.
- Methodological issues – We have made recommendations regarding the treatment of tourism, disruption to trade/services and agricultural losses. Further work is also needed to understand how easily the MDSF model - which we understand is used reasonably widely for strategy level assessments - can be adapted.

A number of issues were identified whose resolution was outside the scope of this project, we have made recommendations for carrying these forward. They concern:

- Identification of property ownership – this is required to support proper application of social equity weighting factors and allocation of impacts to the appropriate economic interest group
- Treatment of social equity – we have recommended that the income distribution of household beneficiaries of flood protection might be handled in a fair and simple way by valuing flood damage to all domestic properties equally in the CBA
- Development of the appraisal process - to optimise the quality assurance of appraisals, allow the additional information provided by the disaggregated approach to be accounted for in the decision

making process, and reduce the cost of the appraisal process
- The interface of the cost benefit analysis (CBA) with the multi criteria analysis (MCA) framework suggested as a way of accounting for non-monetised benefits within the appraisal process and currently being piloted by the EA
- The consistency with which the appraisal approach is currently applied and implications for resource allocation across schemes
- The choice of metric and treatment of contributions

Ultimately the choice of metric is a matter for policy as it reflects the objectives of the risk management programme. Our clear recommendation is that the appropriate benefit:cost metric to use is NPV/ Cg (present value of net benefit/ cost to exchequer), to allow most benefit from the use of public money to be achieved, including the benefit of private contributions.

We suggest there is a need for a single expert authority within government controlling FRM appraisal development, in consultation as occasionally appropriate with the Treasury.

Our detailed recommendations are presented in Section. They are arranged in three categories:
- Adoption of the disaggregated approach
- Methodology development
- Review of processes

Project Report to Defra

8. As a guide this report should be no longer than 20 sides of A4. This report is to provide Defra with details of the outputs of the research project for internal purposes; to meet the terms of the contract; and to allow Defra to publish details of the outputs to meet Environmental Information Regulation or Freedom of Information obligations. This short report to Defra does not preclude contractors from also seeking to publish a full, formal scientific report/paper in an appropriate scientific or other journal/publication. Indeed, Defra actively encourages such publications as part of the contract terms. The report to Defra should include:
   - the scientific objectives as set out in the contract;
   - the extent to which the objectives set out in the contract have been met;
   - details of methods used and the results obtained, including statistical analysis (if appropriate);
   - a discussion of the results and their reliability;
   - the main implications of the findings;
   - possible future work; and
   - any action resulting from the research (e.g. IP, Knowledge Transfer).

OBJECTIVES

The objectives for the work were:

Objective 1: To assess the implications arising from the Sugden-WTP approach and its application to FCERM.

Objective 2: To develop and test a preferred methodology for the appraisal of flood and coastal defence projects using the Sugden-WTP approach. Supporting documentation providing an explanation of the process and any necessary calculation tables will be produced.

Objective 3: To carry out a gap analysis to identify (but not assess) wider implications or gaps of the *Sugden-WTP* approach on various aspects of policy, governance and resource allocation. To provide a clear statement

on any limitations of using the Sugden-WTP approach with particular reference to its practical use for assessing and comparing flood and coastal defence projects.

Objective 4: To report on the work including a draft and final report.

These objectives have been met and are reported in FD2018/TR1, FD2018/TR2 and workbooks 'FD2018 Workbook Oct06.xls' and 'FD2018 AST Sep06.xls'.

METHODS USED

The work involved:

1. A detailed review of the current and proposed disaggregated approach including:
   - Initial information gathering and a stakeholder workshop to gather views and discuss priorities for the first stage of the work
   - An expert review of Sugden's proposals.
   - Development of initial proposals for a preferred methodology and Appraisal Summary Table
2. Development and testing, via case studies, of the preferred methodology using the disaggregated approach.
3. A gap analysis to establish any gaps or wider implications relating to the use of the disaggregated approach for FCERM projects, and
4. Production of a report and supporting documentation

We used a number of sources of information and methods of research to achieve the objectives of the project. While this was essentially desk-based research, we used a variety of tools, techniques and methods (described below) including:

- Telephone and face-to-face interviews and meetings
- Review of relevant literature and existing guidance materials
- Stakeholder workshop
- Case studies

Desk-based reviews:

In addition to the detailed expert review of Professor Sugden's proposals reported in Section 4, we undertook desk-based reviews of existing guidance materials including FHRC's MCM (Penning-Rowsell *et al*. 2005) and existing PAG guidance, to ensure that we had a good understanding of the existing appraisal system. Other literature and materials were reviewed as required.

Interviews

Interviews were used to explore the following issues:

- perceptions of the strengths and weaknesses of the existing appraisal system from the perspective of:
  - project officers from Defra and EA
  - other individuals involved in flood and coastal erosion risk management appraisals and assessments
- detailed technical and economic issues including:
  - insurance issues,
  - the approach to Multi-Criteria Analysis developed and tested for use in FRM project appraisal and decision-making
  - the assumptions underlying the data presented in the 'Multi-Coloured Manual' (MCM) (Penning-Rowsell *et al*. 2005), provided by the flood hazard research centre (FHRC) at Middlesex University, and discussed in a liaison meeting at FHRC which allowed queries to be resolved.

Stakeholder workshop

Early in the project we held an engagement workshop for a range of stakeholders. This was intended to raise awareness of the project, and to gather the opinions of the wide range of participants. The workshop included presentations and discussions involving the whole group. At the end of the workshop we sought suggestions for projects that might make useful case studies. In addition, facilitated breakout sessions were held, designed to elicit views from participants in two areas. Firstly, we sought views on what works well in the current appraisal system and what areas might be helped by a disaggregated approach. Secondly, as the expert review phase of the project included consideration of a number of issues that were desirable but not essential, we asked participants to rank both 'essential' and 'desirable' issues to inform the balance of effort to be allocated to those issues during the expert review . is provided as Appendix A to FD2018/TR1.

Case studies

We used case studies as the main vehicle for testing the disaggregated approach to project appraisal. This required selection of suitable case studies in conjunction with Defra and EA, liaison with EA personnel with responsibility for the selected cases and with the contractors who had undertaken the appraisals on behalf of EA. In one case, liaison was with local authority personnel responsible for the appraisal. Four case studies were undertaken, two schemes and two strategies, including one coastal erosion case study.

The case studies were undertaken using data from appraisals that had been completed, (or were nearing completion). While all contacts were very helpful, providing background data and additional breakdowns where they were available, it must be noted that available data were limited to those required for the current appraisal system, so that in some cases data were not available at the level of disaggregation that we might have preferred. In some instances, assumptions were made so that the method could be tested and demonstrated more fully. These are noted for individual case studies.

Case studies were undertaken one at a time, so that lessons learned and issues arising – such as categories of economic interest groups required - could be considered and addressed before moving to the next case study. Findings from the case studies were presented to a group including Defra and EA officials and FRM appraisal practitioners.

EXPERT REVIEW

The first area of work undertaken was to examine and comment on the reports to Defra by Professor Sugden on "Developing a cost-benefit framework" for flood risk management (Sugden 2005) and "Integrating cost-benefit analysis and multi-criteria analysis" (Sugden 2005). These two reports make many recommendations for introducing into flood risk management (FRM) a disaggregated accounting approach to CBA, which would set out clearly how the costs and benefits of a proposed scheme would be distributed. The reports also made a number of other proposals about general methodology, relating to, for example, the numeraire, the benefit/cost ratio and MCA.

This detailed review of the reports is provided in FD2018/TR2a separate, but a summary of the conclusions and recommendations is included here, together with additional consideration of insurance issues. The balance of effort allocated to each of the issues considered was informed by the output of the engagement workshop held early in the project.

The disaggregated approach

In our review we endorse the disaggregated accounting proposals. We make a specific proposal for the inclusion of private contributions in the CBA benefit/cost ratio. More radically we suggest that the income distribution of household beneficiaries of flood protection might be handled in a fair and simple way by valuing flood damage to all domestic properties equally in the CBA. We endorse the principle of making clear the various sources of funds and the distribution of benefits, and propose an appropriate table of monetised costs and benefits and a consistent Appraisal Summary Table that would bring together the material for a final multi-criteria analysis.

Since the data needed for the disaggregated accounting recommended by Sugden are already available, and the other changes proposed are essentially presentational we conclude that it is unlikely that the ongoing costs of adopting the principles advocated by Sugden would be significant; this conclusion was tested further through the case studies. Discussions with practitioners suggest that modifying existing damage calculation spreadsheets to support a disaggregated presentation would not be an onerous task. For example, in a list of properties, each property might be 'tagged' as pertaining to a particular economic interest group (data sorting should allow this to be done in blocks, rather property by property), with Excel functions such as SUMIF used to aggregate monetised impacts by economic interest group. Costs would be incurred in rolling out a new approach, for example, in preparing guidance materials, ensuring that practitioners understood the requirements of the new approach, and – if a decision was taken to move to market price as the numeraire – in producing datasets in market prices. Issues of property ownership, stakeholder communication and inclusion of broader contributions and benefits (e.g. regeneration) could add complexity. Practitioners would incur 'one-off' costs in reviewing the requirements and amending in house calculational tools. However, our view is that ongoing costs would not be materially higher.

General methodology

We also broadly endorse the recommendations in the main Sugden report on general methodology, with regard to the benefit/cost ratio, where we suggest the denominator should be total net exchequer cost, and with regard to the numeraire, which, with Sugden, we suggest should be expenditure at market prices. We also suggest some further standardisation of terminology, such as the use, following Treasury convention, of appraisal to describe ex ante analysis and evaluation to describe ex post analysis, and a clear understanding of what by convention is included and not included in a "cost benefit analysis".

We are impressed by the professionalism of the current MCA project management, which embraces a strong understanding of MCA. We are also impressed by the quality of the economic advice available in Defra and the EA.

We found that in contrast to practice in Transport appraisal, that there is no single expert authority within government controlling FRM appraisal development, in consultation as occasionally appropriate with the Treasury, in the sense that control is exercised over the development of WebTAG.[1]

A review of the kind launched with Sugden papers inevitably opens up other areas of potential refinement. Examples in this case include the review of the handling and valuation of agricultural and non-agricultural land use impacts, and of impacts on employment. There may also be scope for further work developing from this project in helping to facilitate the coordination of methodological development and of technical expertise.

We also note comments made to us that the appraisal process under the current FRM regime appears to be relatively costly as a percentage of the total programme cost.

As noted above, the priorities for the review reported in the companion report to this report (Jones-Lee and Spackman, 2006) were informed by the views of participants at the workshop described in Appendix A. This included some work on the implications of insurance for the application of the "Sugden", or disaggregated, approach to cost-benefit analysis in flood and coastal defence. However, as work continued on the project, it was decided that some additional work was required in this area. We reviewed literature (in particular Huber 2004 and Crichton 2005) and discussed the issues with a number of experts[2]. Appendix B of FD2018/TR1 summarises these discussions.

It appears that there is now little cross-subsidy between premiums for dwellings at risk from flooding and those not at risk. We conclude that as the market is moving increasingly towards risk-based premiums there is no need for any line in the Appraisal Summary Table for the disaggregated approach to show cross-subsidisation by households not at flood risk of those that are flooded.

Preferred methodology

Our recommendations for a preferred methodology are based on the findings of the review. The detailed suggestions on presentation and handling (see Appendix A of FD2018/TR2) are used as the basis for the calculation and summary tables. In addition, the methodology was informed by work carried out by FHRC setting out the assumptions underlying the data in their multi-coloured manual (see Appendix D of FD2018/TR1). The methodology was tested and developed through a series of case studies presented in the following sections. The methodology thus developed is described later in this report.

CASE STUDIES

Approach

The general approach to each case study was to:

- Discuss the case study with the identified contact:
  For each case study we had an initial discussion with the identified contact to discuss data requirements. We held further discussions to clarify issues such as data availability, relevant economic interest groups, potential additional sources of funding for schemes
- Review data:
  In some instances, particularly for the scheme level appraisals, the data provided were very detailed. We spent some time making sure that we understood the links between the workbooks in sufficient detail to be able to use the data sensibly.
- Identify the relevant economic interest groups:
  Relevant economic interest groups were identified using the project appraisal report supplied by the contact and through discussions. In some instances we selected a single commercial property as representing an economic interest group simply to demonstrate the method, categorising it as an 'Example Business'. In a live test, an example business would be chosen that might be expected to benefit to a significant degree from the scheme. As our 'Example Businesses' were chosen without this knowledge, while they allowed us to demonstrate the method, they would not have the same characteristics in terms of benefits as businesses selected as economic interest groups in a live context.
- Data preparation:
  This involved copying the workbooks provided, and disaggregating some of the calculated damages.

1 This professional role in controlling the development of CBA and NATA in Transport is led by senior management , with substantial professional interest and input at Grade 3 level, and very strong inputs at Grade 5 level, from more than one division.

2 Defra and EA economists, and particularly Matt Crossman, Policy Adviser, Natural Perils, ABI (on secondment from Defra) and Federico di Pace, Economist, ABI

For example, for a detailed scheme appraisal, commercial and residential properties are typically identified separately but damages are aggregated at an early stage as there is no need to keep them separate for the current appraisal methodology. Data preparation in such cases therefore required additional calculations to be undertaken to maintain the separation between residential and commercial damages (and so benefits). As the expert review recommended the use of market prices rather than factor costs we also adjusted some data by adding VAT. From discussions with FHRC, it is apparent that while the damage values in the multi-coloured manual (MCM) (Penning-Rowsell *et al* 2005) are generally presented in the numeraire of factor costs, data from WTP valuations are in market prices. Thus, such data were not adjusted.

- Populate workbook:
  The economic interest groups identified are entered into a 'lists' section of the workbook (see FD2018 Workbook Oct06.xls). This was then used to generate a data entry sheet into which the processed data were entered. The process of generating the data entry areas was increasingly automated and improved as the case studies progressed.
- Review lessons learned:
  Review the case study identifying any useful modifications to the workbook and methodology together with any wider implications.

It is important to note that we designed each case study to test the overall approach and specific aspects of relevance to that case study. Where not all the data required to perform the calculations were readily available it was necessary to make some assumptions, outlined in the notes for each individual case study (see FD2018/TR1). In addition, in all cases, except for case study B, appraisal was nearing completion but not finalised, and so we worked with draft workbooks and not final values. Therefore, the results of the case studies should be considered illustrative of the method, and not representative of the actual values of costs or benefits for the specific cases considered.

RESULTS OF THE CASE STUDIES

Detailed numerical results for the each of the four case studies completed (two strategy level and two scheme level appraisals) are included in FD2018/TR1. The key result from the case studies is a methodology and associated workbook (see FD2018 Workbook Oct06.xls), described below.

Summary of the methodology

The key steps in the outline methodology for a disaggregated approach to flood risk assessment and appraisal developed through the case studies are:

- Identify items to be monetised and items to be dealt with in a wider MCA framework
- Identify economic interest groups
- Calculate costs and benefits for the economic interest groups identified for each option under consideration
- Enter data into summary workbook.

The following subsections outline a draft methodology for each of these stages.

Items to be monetised

CBA can be seen as part of a wider MCA framework for decision-making. In such a framework it is important to ensure that at the outset it is clear which items are to be monetised and which are to be handled within the wider MCA framework, either quantitatively or qualitatively. The chief advantage of ensuring this step is formalised and the outcome recorded is that it will reduce the possibility of double counting of costs or benefits that might otherwise occur. In particular such double counting is possible for intangible items.

Consideration should be given to including a generic list of impacts in appraisal guidance to inform context specific impact identification. Guidance might also be provided on issues to be considered when making a decision on whether to monetise an impact, or to handle them quantitatively or qualitatively.

Economic interest groups

Testing of the method suggests a requirement for four categories within which economic interest groups should be specified by the appraiser:

1. UK public bodies
2. EU bodies
3. Businesses

4. Residential property owners

In addition to these four categories, some additional categories are included in the summary workbook. (As these are treated, for pragmatic reasons, as economic interest groups in their own right, there is no requirement to specify economic interest groups within these categories.) These include environmental and heritage value, tourism and recreation and amenity value, and development and regeneration benefits.

UK public bodies should always include 'FRM budget' as an item, as we expect that invariably, funding from the FRM budget will be included in the appraisal; otherwise the appraisal might not be necessary. In addition to this, any other UK public bodies that are affected or might provide funding should be listed, such as Environment Agency Waterways, Local Authorities, County Councils and Regional Development Agencies. EU bodies should include any potential sources of European funding such as the European Regional Development Fund.

Businesses should include any relevant business or group of businesses (e.g. a group of businesses on an industrial estate, or large businesses and small businesses) affected that might contribute financially to a scheme. Utilities and an 'other businesses' group should also be included. If 'disruption to trade/ loss of profit' is included as a cost category, then it may be necessary to include a line for businesses making a corresponding gain. In the calculus of social costs and benefits this would not be necessary as transfers within the economy would be netted out.

Residential property owners should always include households. If most households in the flood Risk area are owner-occupied, inclusion of this category alone may be adequate. However, if there is significant social housing or private rented housing then it may be necessary to include other economic interest groups such as local authority, registered social landlords and private landlords. Note that households and property owners (if different) must be kept separate for two reasons. Firstly, damage to household inventory items represents a loss to the householder, while damage to building fabric is a loss to the property owner (which may be a UK public body, for example a District Council). Secondly, if equity multipliers are used to reflect social mix, then this should only be applied to losses to householders, ie for rented accommodation, to household inventory losses. (This is not new but simply reflects Defra's supplementary guidance and advice in the Multi-coloured manual.) A further issue that may be material in some instances relates to holiday lets. It is likely that such property is generally categorised as residential, whereas it might probably be categorised as commercial property.

In addition, there may be instances where it is appropriate to identify more than one household interest group, and to identify, e.g. more than one group of owner-occupiers. For example, it may be appropriate to identify different socio-economic groups, or different wards (where, say, one ward is a deprived area and others are not), or different geographical areas (where, say, different geographical areas have different standards of protection).

Calculation of costs and benefits

Costs and benefits should be calculated separately for each economic interest group identified and for each of the options under consideration. The data used to calculate the benefits of flood risk management (in particular, FHRC's MCM, Penning-Rowsell *et al* 2005) are available at a level of detail to allow benefits to be calculated at the level of disaggregation required. For example, damage data are available separately for household inventory items and damage to building fabric. The data are currently presented as factor costs but converting these to market prices in most cases simply requires the addition of VAT. Ideally, if this method were implemented widely, then damage data should be revised and presented in market prices.

The categories of costs and benefits included in the draft workbook are shown, below, with methodological comments. Values are entered for each option under consideration, including a 'Do nothing' option.

Costs and benefits

Monetised Costs	**Comments**
Total monetised cost	Net present value of project costs, using the discount rates specified in existing guidance.
Funded from:	
UK Public Agencies	This section is used to enter known contributions, or assumed contributions from non-FRM budget sources. Alternative scenarios could be created using this.
FRM budget	
UK Public body 1	
EU bodies	
EU body 1	
Businesses and other sources	
Business or Group 1	
Increase in agricultural subsidies	
Total monetised damage	
Total monetised FRM benefits	Inclusion of this item is only necessary if the appraiser wishes to separate out FRM benefits from other benefits, or the appraisal methodology requires calculation of metrics taking account only of FRM benefits. This will require benefits to be 'tagged' in the worksheet as FRM benefits.
Total monetised benefits	

Monetised Costs	Comments
of which:	
Reduced flood damage to/ abandonment of buildings ie damage avoided	
of which:	
Residential damage avoided	the worksheet calculates damage avoided from the values for damage entered below
Inventory/ damage	
social equity adjustment	
Property owners 1	
Property owners 2	
Residential damage	
Inventory/ damage	Household inventory damage is included as a separate line because we assume that it is always householders who incur losses due to this damage, whereas building fabric damage is incurred by the property owner, who is not always the householder.
social equity adjustment	A separate line is included for any social equity adjustment made to improve transparency. This makes it clearer whether distribution of impact weighting has been applied to the monetised benefits, and makes it easier to to see the magnitude of, and so assess the effect of such weighting.
Building fabric damage -Property owners 1	As noted above the property-owner is not always the household and so the worksheet allows different economic interest groups to be entered here. Note that where a local authority owns residential properties it will appear as an interest group both for residential damages and for UK public agencies damage. This is because it seems appropriate, in the interests of transparency and to aid decision-making two shows the effect on residential properties separately. In the case studies completed for this work, inventory and building fabric damages were aggregated at an early stage in the calculation of damages. However, we do not believe that it would be onerous to present inventories and building fabric damages separately.
Building fabric damage - Property owners 2	
UK Public Agencies damage avoided	As above in the worksheet, these cells are calculated from the damages entered below.
FRM budget	
UK Public body 1	
Public Agencies damage	
FRM budget	The value of flood damage or abandonment of buildings due to flooding for UK public bodies should be entered here, for each UK public body identified.
UK Public body 1	
Businesses – damage avoided	As above in the worksheet backspace, these cells are calculated from the damages entered below.
Business or Group 1	
Other businesses	
Businesses – damage avoided	The value of the damage or abandonment of buildings due to flooding for any businesses should be identified here for each relevant economic interest group identified. While not implemented at present, there may be a need to separate occupation from ownership as for residential properties..
Business or Group 1	
Other businesses	
Reduced flood damage to/ abandonment of agricultural land (damage avoided)	
Damage to agricultural land	There appear to be no additional methodological issues associated with this item.
Reduced disruption to trade/ loss of profit (damage avoided)	As FD2108/TR2 discusses, loss of profit is a cost to the disrupted business. Even if it were not counted as a net loss at the national or regional level, there would remain a case for recording it as a loss to one business, with another line recording a profit gain to other, non-flooded businesses. We have not investigated data sources for profits, but we would expect broad brush data such as national average figures for profit as a ratio to sales area (and/or possibly as a percentage of turnover) for business categories to be readily available and sufficiently accurate. Additional work may be necessary to determine whether such data are available, and whether the additional effort associated with including this category is proportionate to its contribution to improved decision-making.
Business or Group 1	
Other businesses	
Disruption to trade (damage)	
Business or Group 1	
Other businesses	

Monetised Costs	Comments
Net impact on transport, utilities, emergency services (damage avoided)	
of which:	
emergency services damage avoided	As above, in the worksheet, this cell is calculated from the damages entered below.
emergency services damage/ cost	There appear to be no additional methodological issues associated with this item.
transport users damage avoided	As above, in the worksheet, this cell is calculated from the damages entered below.
transport users damage	There appear to be no additional methodological issues associated with this item.
Public Agencies (damage avoided)	As above, in the worksheet, these cells are calculated from the damages entered below.
FRM budget	
UK Public body 1	
Public Agencies (damage)	These items are included to allow for any damages to UK public agencies, in addition to those associated with transport or emergency services. Any benefits other than reduced damages are entered into the cells above.
FRM budget	
UK Public body 1	
Businesses (damage avoided)	As above, in the worksheet, these cells are calculated from the damages entered below.
Business or Group 1	
Other businesses	
Businesses (damage)	These items are included to allow for any damages to businesses. Any benefits other than reduced damages are entered into the cells above.
Business or Group 1	
Other businesses	
Intangibles (households) - damage avoided	
Intangibles (households) – damage	This item is included to allow for intangible items for households such as stress.
Environmental/heritage value damage avoided	This category is treated as an economic interest group; while there is some overlap with other groups (eg householders), considering this category as applying to 'those benefiting from improvements in or reduced damage to the environment etc.' is a pragmatic and tractable approach.
Environmental/heritage value damage	
of which	
historic environment	
landscape and visual amenity	
other	
Impact on recreational value/ tourism/ amenity - benefits, damage avoided	As above, while in reality there is overlap between those benefiting from recreational value etc and other groups such as householders, treating those who benefit from tourism, recreation and amenity is a pragmatic and tractable approach.
Recreational value etc - damage	
Recreational value/ tourism – benefits	
Development/ regeneration benefits	The inclusion of development or regeneration benefits is a policy issue, and so beyond the scope of this study; however, inclusion of such benefits in a transparent manner is facilitated by the disaggregated presentation. In the Boston Strategy case study, while regeneration benefits are recognised in the project appraisal report, they are not monetised.
Business or Group 1	
Other businesses	

Data summary

Once the costs and benefits have been calculated for the economic interest groups identified and the options under consideration, entering data into the summary workbook is a straightforward exercise. The tables may be usefully complemented by the use of graphical presentation of some results. The calculation table (blank, for three nominal schemes, with nominal economic interest groups) is shown immediately below – data is entered into the yellow cells. The comparison summary table is shown below this.

Calculation table:

		Option 1 - Do Nothing	Option 2 - Scheme 1	Option 3 - Scheme 2
Monetised Costs		**£ k**	**£ k**	**£ k**
Total monetised cost				
Funded from:				
UK Public Agencies				
FRM budget	FRM budget			
UK Public body 1	RDA			
EU bodies				

		Option 1 - Do Nothing	Option 2 - Scheme 1	Option 3 - Scheme 2
EU body 1	ERDF			
Businesses and other sources				
Business or Group 1	Example Business			
Increase in agricultural subsidies				
Total monetised damage				
Total monetised FRM benefits				
Total monetised benefits				
of which:				
Reduced flood damage to/ abandonment of buildings ie damage avoided				
of which:				
Residential damage avoided				
Inventory/ damage	Households			
social equity adjustment				
Property owners 1	Owner occupiers			
Property owners 2	Local authority			
Residential damage				
Inventory/ damage	Households			
Property owners 1	Owner occupiers			
Property owners 2	Local authority			
UK Public Agencies damage avoided				
FRM budget	FRM budget			
UK Public body 1	RDA			
Public Agencies damage				
FRM budget	FRM budget			
UK Public body 1	RDA			
Businesses - damage avoided				
Business or Group 1	Example Business			
Other businesses	Other businesses			
Business or Group 1	Example Business			
Other businesses	Other businesses			
Reduced flood damage to/ abandonment of agricultural land (damage avoided)				
Damage to agricultural land				
Reduced disruption to trade (damage avoided)				
Business or Group 1	Example Business			
Other businesses	Other businesses			
Disruption to trade (damage)				
Business or Group 1	Example Business			
Other businesses	Other businesses			
Net impact on transport, utilities, emergency services (damage avoided)				
of which:				
emergency services damage avoided				
emergency services damage/ cost				
transport users damage avoided				
transport users damage				
Public Agencies (damage avoided)				
FRM budget	FRM budget			
UK Public body 1	RDA			
Public Agencies (damage)				
FRM budget	FRM budget			
UK Public body 1	RDA			
Businesses (damage avoided)				
Business or Group 1	Example Business			
Other businesses	Other businesses			
Businesses (damage)				
Business or Group 1	Example Business			
Other businesses	Other businesses			
Intangibles (households) - damage avoided	Households			
Intangibles (households) - damage	Households			

		Option 1 - Do Nothing	Option 2 - Scheme 1	Option 3 - Scheme 2
Environmental/heritage value damage avoided				
Environmental/heritage value damage				
of which				
historic environment				
landscape and visual amenity				
other				
Impact on recreational value/ tourism - benefits, damage avoided				
Recreational value - damage				
Recreational value/ tourism - benefits				
Development/ regeneration benefits				
Business or Group 1	Example Business			
Other businesses	Other businesses			

Comparison summary table:

	Option 1 - Do Nothing	Option 2 - Scheme 1	Option 3 - Scheme 2
Gross benefit = B(total)			
FRM benefits = B(frm)			
Net benefit (net present value, NPV) = B(total) – C(total)			
Net FRM benefit (NPV(frm) = B(frm)-C(frm)			
Total cost (PV, C(total))			
Net exchequer cost = C(g)			
Net cost to FRM budget = C(frm)			
B/Cg = B(total)/C(g)			
B/Cg incremental			
B(frm)/C(frm) = B(total)/C(frm)			
B(frm)/C(frm) incremental			
NPV/Cg			
highest NPV/Cg			
NPV/Cg incremental			
NPV(frm)/C(frm)			
NPV(frm)/C(frm) incremental			
Assumed funding sources			
UK public agencies of which:			
FRM budget			
Regional development agency			
EU funding sources of which:			
ERDF			
Businesses and other sources:			
Example Business			
Attribution of net benefits			
Residential of which:			
inventory damage avoided			
social equity adjustment			
intangibles eg stress			
Property loss - Owner occupiers			
Property loss - Local authority			
UK public bodies			
FRM budget			
Regional development agency			
EU public bodies			
ERDF			
Specified Businesses and other sources			
Example Business			
Other Businesses			
Environmental/ heritage			
Recreation/ amenity			
Emergency Services			
Transport			
Agriculture			

DISCUSSION AND GAP ANALYSIS

This section takes account both of the work reported in earlier sections and of discussions at the Making Space for Water Steering Group regarding the work. We identify here a range of issues for further consideration, highlighting in the boxes particular points or questions that could usefully be addressed.

Advantages of the method

We find the approach has the following advantages:

- The method provides greater transparency and more information to aid decision making. With the previous "SCB" approach, whilst it would be possible to disaggregate results in many cases, some significant transfers between groups are not generally evaluated and these transfers are further hidden in the aggregation of resource costs and benefits.
- The approach supports both improved quality assurance of appraisals, and optimisation of option design, by making it easier to see which costs and benefits are the most important and to question these where appropriate
- It makes it clearer what has been monetised and included in the appraisal and what has not: for example whether a social equity adjustment has been made or not, whether allowance has been included for household stress due to flooding or not and what the impact of these is.
- It allows the benefit of schemes to individual businesses or groups of businesses to be identified and therefore may assist in negotiation of contributions from third parties.

Areas for further consideration

We have identified a number of areas where further research, or policy input, is required.

Data issues

The FHRC MCM data: These datasets, for residential and non-residential property, record the property located on floodplains in England and Wales and the losses to be expected for different types of property, according to the type of dwelling, its age and the social class of its occupants, as a result of flooding of different depths and duration. As noted earlier, FHRC have set out the assumptions underpinning the data in the MCM, (see Appendix D of FD2018/TR1), highlighting areas where data are acknowledged to be relatively poor (e.g. some areas of non-residential properties), and the use of secondary data sources. The data held are very sophisticated and appear to meet virtually all the needs of the disaggregated accounting approach to CBA.

It seems evident from these case studies that current practice is intended to be that all costs use the numeraire of 'factor cost' – that is market prices adjusted downwards to remove indirect taxes. The MCM data are currently largely recorded in the numeraire of 'factor costs'. However the WTP methodologies used to estimate eg amenity values almost certainly produce valuations at market prices. We recommend that 'market prices' are used throughout in future and that if this recommendation is adopted, the data are represented consistently in this format. As indicated in Appendix D of FD2018/TR1, FHRC believe that this would be a straightforward change to make.

Gap: The use of market prices may result in unintended consequences. It is believed that in some transport scheme appraisals, options resulting in fewer miles driven and savings in driver time have appeared to result in lower net benefits than schemes resulting in more miles driven. This appears to be because their cost to central government has been higher, owing to lower revenues from fuel duty. It will be necessary to identify whether such counter-intuitive results might arise in the context of FRM appraisals, and to determine how these can properly be handled.

Other Numeraire issues: While this appears to be a relatively minor issue for most categories of cost and benefit there may be a need for more work in some areas including:

- agricultural issues (which were not a significant feature of the case studies). A review of the handling and valuation of agricultural and non-agricultural land use impacts may be needed.
- house prices and capping of damages.

Agricultural impacts - The current approach to estimating agricultural benefits focuses on agricultural output. However farm economies are now increasingly dependent on diversification. And much agricultural land use policy is now focused on environmental quality.

Gap: The handling of "agricultural" impacts in FRM appraisal (including but not limited to the CBA) should be reviewed, with an objective of incorporating all the economic, environmental

and social consequences of the change in the potential uses of the land that would be provided by the FRM investment, which may include, for example, the opportunity for the farmer owner to diversify land into non-agricultural use.

House prices and capping of damages – the appraisal methodology caps damage to properties at the property value. We have recommended using market prices for damages rather than factor costs but we note that this will affect the point at which damages are capped:

- If damages are increased by VAT, capping will occur at reduced flood depths.
- Stamp duty and other transaction charges should also be added to the house value. Our view however is that it is probably not worth doing this as:
- The effort will be disproportionate to the benefit
- The stamp duties and transaction charges will be lower in percentage terms than the increases in damage values
- Property valuations will be subject to uncertainty.

It has been suggested that replacement costs could be used instead of economic cost. Our recommendation is that replacement costs are not suitable for use in CBA and that the appraisal process should continue to use economic costs, e.g. assuming that, on average, items lost will be halfway through their useful economic life.

Gap: More work is required to understand the significance of property and capping issues to decision making, particularly to coastal erosion, which is largely concerned with property values.

Property ownership: One area that may require additional work is identifying property ownership. Damage to inventory is incurred by householders, but damage to building fabric is incurred by the owner. It is desirable to identify property owners for residential properties, so that damage to building fabric can be attributed to the relevant economic interest group. Identifying ownership of residential properties also allows more appropriate use of distributional weighting factors.

Identifying ownership should be a feature of existing appraisals where distributional impact weighting is applied, to ensure that where properties are not owner-occupied, the weighting factor is applied only to the household inventory damage. Our limited sample of case studies does not demonstrate whether this is the case, but we understand that property ownership is not straightforward to identify.

The limitations of carrying out case studies based on information available from existing appraisals means that the work reported here could not explore in any detail how much property owners and property occupiers would benefit relative to one another, from a project or strategy. From the work completed, we would suggest identifying owners as householders, local authorities or other UK public bodies, registered social landlords and private landlords.

Gap: Further work would be useful to identify how significant residential property ownership issues might be, and what data sources exist that might be of use. Census data may be useful, and it has been suggested that collaboration with the NaFRA project may be helpful. Local authorities have databases that may be of use, particularly to social housing. Research might seek to answer questions such as:

- How best would residential property ownership be studied under the disaggregated approach?
- Can ownership be separated so that private households are considered, with commercial interests addressed separately?
- Can social housing be identified?
- Can second homes, holiday lets and buy-to-let properties be identified separately from other properties?
- How difficult, timeconsuming and costly is it to do this?
- How should these groups be considered in appraisal?
- What are the benefits of doing this?

<u>Methodological issues</u>

Choice of metric and contributions: The findings of the case studies, though based on a very limited number of examples, suggest that the choice of ratio, in particular the choice of whether to include wider benefits than the FRM costs and benefits can have a material impact on the ranking of options. Our view remains that the

appropriate benefit:cost metric to use is NPV/ Cg taking contribution into account, to allow most benefit from the use of public money to be achieved.

While some non-FRM benefits, such as navigation benefits, are currently included in appraisals, regeneration and other broader benefits generally are not. Including wider benefits has two implications:

- The potential relationships between different strategies within a region can be explicitly recognised within the appraisal and decisions optimised over all objectives (FCM, regeneration etc).
- Resource allocation would be affected using the current approach as projects with contributions would get higher scores under the prioritisation system.

This in our view is the most defensible interpretation of Green Book principles. CBA should include **all** those social cost and benefits that can be valued in monetary terms (i.e. the NPV) and the relevant constraint, from the Government's perspective is total public spending – hence the use in Transport appraisal of a social cost of exchequer finance (SOCEF). Attribution of some benefits as non-FRM may have legitimate impact with regard to which department should pay for them, but not on the CBA. The FRM budget determines the total that can be spent on the FRM programme, but is not in national welfare (i.e. Green Book) terms relevant to the prioritisation of projects.

Gap: Further work should be carried out to determine the impact of a change in metric on the FRM programme.

Social Equity: We note that in the case studies the treatment of social equity has been addressed in different ways. While clearly recognised as an issue in three of the case studies, in two cases no adjustment has been made to the monetised benefits of flood risk management. Instead, ward deprivation indices have been noted in the project appraisal report. In one case study a monetary adjustment has been made within the economic appraisal. As a minimum, we suggest showing any monetary adjustment made on a separate line so that the impact can be identified clearly. However, we have recommended that the income distribution of household beneficiaries of flood protection might be handled in a fair and simple way by valuing flood damage to all domestic properties equally in the CBA using some appropriate average value. This would require additional work to confirm feasibility and determine appropriate values. A number of approaches could be taken. For example, a single average house price could be used, based on a region, a ward, a parish or a post-code area. Alongside use of an average, economic impact could be disaggregated by use, for example, owner-occupied homes v. holiday lets, and buy to let properties.

Gap: Adoption of a simplified approach to social equity may or may not in the end be a technically and politically robust solution, further discussion of its merits, with some investigation of how it might work in practice is required, considering what average property value might be used, and whether disaggregation by residential property use would be appropriate.

Treatment of tourism: Currently tourism is considered as a separate class of benefit. However, tourists come from outside the immediate area. We suggest separating out hard economic tourism impacts to local businesses, from e.g. value of landscape, which is often less easy to establish, and attributing this latter benefit, as appropriate, to a separate economic interest group "tourists". It should be recognised however that amenity and landscape benefits are also of value to local people. If such an approach were adopted, care would have to be taken to avoid double-counting.

Disruption to trade/services: We have not seen any example where these are included in the appraisal. While it is recognised that private companies may move to a new location at lower risk of flooding, there will still be some disruption to trade associated with the move. Utilities cannot generally move and disruption of services can result in significant knock on and indirect impacts.

Gap: Work to establish the significance of the impact of disruption and the practicality of establishing values for inclusion in appraisals is recommended

<u>Process issues</u>

Quality assurance of appraisals: Appraisal calculations are subject to quality checks at the detailed level, however concerns have been raised about how some fundamental decisions are made about e.g. the costs and benefits to include in the appraisal, how to define the 'do nothing' option etc. We have found that presentation of the disaggregated information can prompt questions about the validity of underlying appraisal assumptions; processes are required to ensure that this scrutiny can be applied at an appropriate stage of the appraisal. .

Gap: There is a need to establish whether appropriate check points exist within the process at which the following can be reviewed:

- Identification of economic interest groups

- Costs and benefits to be monetised
- The ‘do nothing’ option
- Emerging information about the significance of different costs and benefits

Accounting for additional information: Intra-scheme decision making is clearly helped by the disaggregated presentation which provides more information about what makes different options "tick". For example we have found that benefits can build up at different rates for different interest groups depending on the level of protection offered by an option. The approach also makes clear the contribution of different types of cost and benefit (which may have different levels of confidence associated with their derivation) and can show whether one particular type of impact is dominating the cost: benefit ratio.

Gap: Research is required to explore how the additional information offered by the disaggregated approach can be taken into account in decision-making, both for choosing the best option for a particular scheme, and choosing between schemes.

Communication with Stakeholders: The greater transparency achieved by the method could have both positive and negative impacts in terms of communicating with stakeholders. The improved transparency will assist explanation of decisions that have been made and should, in the long term if handled well, help promote acceptability of decisions. However, additional transparency may provoke more questions and adverse comments by some stakeholders, especially those identified as ‘losers’. This will particularly be the case if:

- the way in which decisions are made appears to take no account of the information from the disaggregated presentation (see above)
- the stakeholders believe that important economic groups, costs or benefits have not been included, or
- information provided by stakeholders appears not to have been taken into account

Gap: If the dissagreggated approach is adopted quidance will be required for analysts and decision makers both on how to conduct communications with stakeholders, and how to communicate what may be unwelcome news effetively, taking into account the dissagregated information.

MCA: Implementation of the CBA within an MCA framework has been suggested as a way of accounting for non-monetised benefits within the appraisal process. This is especially important because of the danger that improvement of the CBA may give even more emphasis in decision making to impacts that can be monetised at the expense of those that cannot. Care is required to ensure double counting is avoided both between the CBA and the rest of the MCA, and in the resource prioritisation process. An MCA process is currently being piloted by the EA. This pilot provides an ideal opportunity to test both the application of the disaggregated approach and its integration within the MCA. (Note that MCA is discussed in more detail in the companion report to this (Jones-Lee, Spackman 2006).)

Consistency of approach: The appraisal process serves two roles:

- to systematically explore and develop the various options for delivering a scheme, and
- to allocate scarce resources between different schemes.

The latter requires that the approach is applied consistently from scheme to scheme. The disaggregated approach makes it clearer which schemes benefit e.g. from higher values derived from equity weighting and from higher valuations for amenity/ recreation/ environment. If some appraisals monetise environmental aspects, and some do not, some place a monetary weighting on social equity issues and some do not, how can a prioritisation process compare the metrics on a like for like basis? This is also an inherent difficulty for MCA approaches. How do MCA outputs feed into inter-scheme prioritisation?

Leadership and co-ordination: We found, in contrast to practice in Transport appraisal, that there is no single expert authority within government controlling FRM appraisal development, in consultation as occasionally appropriate with the Treasury, in the sense that control is exercised over the development of WebTAG. One of the areas where this is potentially an issue is in the development of a technically sound, workable and authoritative set of procedures to integrate the CBA and other aspects of FRM appraisal, including, most importantly, the prospective OM regime. This appears to be an issue of management structure more than resource availability.

Level of application: We have tested the disaggregated approach at the scheme appraisal and strategy levels. While in theory, the disaggregated approach can be used at other levels (eg catchment flood management plan (CFMP)/ shoreline management plan (SMP)), we have not tested the approach at these levels. The number of economic interest groups considered, and the level of detail of the economic appraisal may differ as one moves from CFMP to scheme appraisal. This may lead to different levels of aggregation at different levels of application, in the absence of specific guidance.

Gap: If the disaggregated approach is adopted, further thought should be given to the degree of disaggregation appropriate to different levels of appraisal. Consideration should be given to issues such as the value offered in terms of decision-making compared with the additional effort required, the level of detail of appraisal at different levels. Policy objectives and the requirements of programme-level decision-making frameworks should inform any such consideration.

Contributions, and multi-objective projects: The disaggregated approach appears to offer potential benefits when considering contributions and multi-objective projects. In both cases, it offers transparency, allowing the decision-maker to see the size of benefits and disbenefits accruing to potential contributors, and the various potential funders and beneficiaries of multi-objective projects. To achieve this transparency the appraiser must define the economic interest groups to include potential contributors, and for multi-objective schemes, potential funders and beneficiaries.

Gap: If the disaggregated approach is adopted, consideration should be given to what guidance should specify in terms of identifying potential contributors and co-funders. Any review of policy objectives should consider the extent to which potential contributions and issues surrounding multi-objective schemes should be taken into account in decision-making. We note earlier that further work would be desirable to determine the impact of a change in metric on the FRM programme. Any such work should take particular account of projects with potential contributions and multi-objective projects, in comparison with 'standard' projects.

Terminology: We recommend that some further standardisation of terminology, such as the use, following Treasury convention, of appraisal to describe ex ante analysis and evaluation to describe ex post analysis, and a clear understanding of what by convention is included and not included in a "cost benefit analysis".

The Treasury has for many years encouraged the use in central government of "appraisal" to describe ex ante analysis and "evaluation" to describe ex post analysis.[3] However outside central government "evaluation" is often used more loosely, sometimes to describe either ex ante or ex post analysis (it often not being clear which) and sometimes in place of valuation (i.e. giving a monetary value). This loose usage, and associated confusion, occasionally creeps into central government. It could help communication in Defra and the EA if the Treasury convention were uniformly adopted.

Costs of implementation

Resource requirement and toolkit development: We explored with practitioners whether the disaggregated method would be more complex to apply and involve significantly more work. The conclusion was that in most cases it would not be. Discussions with practitioners have identified means by which existing damage calculators could be modified to allow data to be produced at the level of disaggregation required at modest cost. Excel is widely used, and lists of properties could be coded by economic interest group, with Excel functions such as "SUMIF" used to aggregate at economic interest group level. Further work is needed to understand how easily the MDSF model can be adapted. We understand this is used reasonably widely, particularly for strategy level assessments, and so further research on modifying MDSF could be beneficial, if this approach were adopted.

Implementation: Since the data needed for the disaggregated accounting recommended by Sugden are already available, practitioners confirm that the process is unlikely to involve significantly more work. Therefore, as the other changes proposed are essentially presentational, we conclude that it is unlikely that the ongoing costs of adopting the principles advocated by Sugden would be significant. We note however the issues of property ownership, stakeholder communication and inclusion of broader contributions and benefits (e.g. regeneration) could add complexity.

Rolling out the new approach would of course incur costs, associated with ensuring that guidance materials were available, and practitioners understand the requirements for the new approach.

In addition, we find that the methodologies used for the calculation of different impacts vary in the level of detail applied and the confidence that can be placed in the result. The disaggregated approach, if applied iteratively at increasing level of detail, could help reduce the cost of appraisals by allowing early indication of the factors likely to be most important to the decision making process, therefore focussing effort where it is most useful. We suggest that the review should consider how and if iterative development in this way can be applied effectively to FRM appraisal to reduce costs

CONCLUSIONS

We have tested and developed the approach recommended by Professor Sugden and we endorse the principle of making clear the various sources of funds and the distribution of benefits. We have developed an appropriate table of monetised costs and benefits and a consistent Appraisal Summary Table that would bring together the

3 See for example the current and previous editions of the Treasury Green Book..

material for a final multi-criteria analysis. We have developed and tested templates for their use in appraisal. We find the approach has the following advantages:

- The method provides greater transparency and more information to aid decision making.
- The approach supports both improved quality assurance of appraisals, and optimisation of option design
- It makes it clearer what has been monetised and included in the appraisal and what has not.
- It allows the benefit of schemes to individual businesses or groups of businesses to be identified and therefore may assist in negotiation of contributions from third parties.

Data are generally available to support the application of the approach and practitioners confirm that the process is unlikely to involve significantly more work.

From discussions with the ABI it appears that there is now little cross-subsidy between premiums for dwellings at risk from flooding and those not at risk. We conclude that as the market is moving increasingly towards risk-based premiums there is no need for any line in the Appraisal Summary Table for the disaggregated approach to show cross-subsidisation by households not at flood risk of those that are flooded.

A number of issues were identified whose resolution requires further research, or policy input, or was outside the scope of this project, we have made recommendations for carrying these forward. They concern:

- Market prices – the recommendation to use the numeraire of market prices has implications for the FHRC MCM datasets and capping of damages.
- Identification of property ownership – this is required to support proper application of social equity weighting factors and allocation of impacts to the appropriate economic interest group.
- Treatment of social equity – we have recommended that the income distribution of household beneficiaries of flood protection might be handled in a fair and simple way by valuing flood damage to all domestic properties equally in the CBA. It may or may not in the end be a technically and politically robust solution, but we commend it as an approach meriting discussion on its merits, with some investigation of how it might work in practice.
- Other Methodological issues – we have made recommendations regarding the treatment of tourism, disruption to trade/services and agricultural losses. Further work is also needed to understand how easily the MDSF model, which we understand is used reasonably widely for strategy level assessments, can be adapted.
- Development of the appraisal process – this is required to optimise the quality assurance of appraisals and allow the additional information provided by the disaggregated approach to be accounted for in the decision making process, and reduce the cost of the appraisal process
- MCA - The interface of the cost benefit analysis (CBA) with the multi criteria analysis (MCA) framework suggested as a way of accounting for non-monetised benefits within the appraisal process and currently being piloted by the EA requires testing.
- Consistency – the consistency with which the appraisal approach is currently applied and implications for resource allocation across schemes
- Choice of metric – the impact of the choice of metric and treatment of contributions in the FRM programme.

Ultimately the choice of metric is a matter for policy as it reflects the objectives of the risk management programme i.e. is the flood risk management programme trying to achieve most value for each pound of government money spent, most houses protected etc? There is a need for clear Defra policy, agreed with HM Treasury, on the use of ratios in investment appraisal. Our clear recommendation is that the appropriate benefit:cost metric to use is NPV/ Cg, to allow most benefit from the use of public money to be achieved, including the benefit of private contributions.

We suggest there is a need for a single expert authority within government controlling FRM appraisal development, in consultation as occasionally appropriate with the Treasury. A particular area where this will be important will be the development of an MCA methodology. This will depend upon the MCA expertise in the Environment Agency and the economics expertise in Defra/EA working closely together and developing a good understanding of each other's field of expertise, preferably promoted by a strong Senior Civil Service lead. This is especially important because of the danger that improvement of the CBA may give even more emphasis in decision making to impacts that can be monetised at the expense of those that cannot.

RECOMMENDATIONS

We recommend that the disaggregated approach should be taken forward with further development as described below, key areas include the numeraire, metric, MCA and equity.

Implementation of the disaggregated approach

We recommend that:

1. The benefit:cost metric used should be NPV/ Cg, to allow most benefit from the use of public money to be achieved, taking into account the benefit of private contributions.
   Ultimately the choice of metric is a matter for policy. A consequence of the choice of NPV/Cg, which we believe is the most defensible interpretation of the green book, is that FRM expenditure may not be optimised in terms of FRM benefits. We suggest that some further work is carried out to assess the impact of this change of metric on the FRM programme (see recommendation 12 below).
2. The numeraire of 'market prices' should be used and the data represented in the FHRC MCM datasets consistently in this format.
   Some further investigation is required to identify any circumstances that could give rise to counter-intuitive appraisal results arising from this choice and establish methods for handling them (see recommendation 12 below).
3. The templates developed by this project, and guidance documentation should be further developed through a pilot application. This could cost-effectively be included as part of the current EA MCA pilot.
4. Guidance on its application should be incorporated in the MCM.
5. We recommend that a single expert source within government is considered to oversee appraisal development, in consultation as occasionally appropriate with the Treasury
6. To avoid confusion, we recommend some further standardisation of terminology, such as the use, following Treasury convention, of appraisal to describe ex ante analysis and evaluation to describe ex post analysis, and a clear understanding of what by convention is included and not included in a "cost benefit analysis".

Methodology development

7. We have suggested that the income distribution of household beneficiaries of flood protection might be handled in a fair and simple way by valuing flood damage to all domestic properties equally in the CBA using some appropriate average value. Additional work should be carried out to confirm the feasibility of this approach and determine appropriate values. As a minimum any monetary adjustment made for social equity should be shown on a separate line in the AST so that the impact can be shown clearly.
8. Implementation of the disaggregated approach to CBA within an MCA framework should be included within the current EA MCA pilot.
9. Further work is needed to understand how easily the MDSF model can be adapted. We understand this is used reasonably widely, particularly for strategy level assessments..

Review of processes

10. A process review should be carried out to establish:
    a. Whether appropriate check points exist within the appraisal process at which the following can be reviewed:
       - Identification of economic interest groups
       - Costs and benefits to be monetised
       - The 'do nothing' option
       - Emerging information about the significance of different costs and benefits.
    b. Whether, and how, additional information emerging from the disaggregated approach can be taken into account within the current appraisal decision making process. This information includes the rates at which benefits build up for different interest groups depending on the level of protection offered by an option, the most significant factors contributing to an appraisal and the level of certainty associated with their derivation.
    c. The feasibility of developing a more iterative approach to appraisal to help control the costs of appraisal further the components of appraisal costs compare with the corresponding components of appraisal in Highways and possibly other capital intensive public service programmes.
11. The impact of the greater transparency achieved on the process of communication with stakeholders should be assessed and training developed for practitioners.

12. A sample of appraisals should be examined and further work carried out regarding:

- the impact of the change of metric
- the handling and valuation of agricultural and non-agricultural land use
- the costs and benefits of routinely identifying residential property ownership and holiday lets
- potential counter-intuitive impacts of adopting market prices
- how the use of market prices for damages rather than factor costs will affect the point at which damages are capped and the significance of this to decision making
- the costs and benefits of adding stamp duty and transaction costs to property values; we expect that the costs will outweigh the benefits
- the impact of business disruption to private businesses and utilities, and the potential knock-on impacts of the loss of utilities, and the practicality of establishing values for inclusion in appraisals.

Such a review could also usefully examine the consistency with which the current appraisal process is being applied it this is not being assessed through the current review of the evidence base for appraisal. It could also examine in more detail the use of replacement costs in place of economic values in appraisals, although note that we do not recommend their use in CBA.

References to published material

9. This section should be used to record links (hypertext links where possible) or references to other published material generated by, or relating to this project.

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