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Strengthening investment decisions in flood and coastal risk management – a review of skills and guidance in benefit:cost assessment.

FRS18201/R

Flood and Coastal Erosion Risk Management Research and Development Programme

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Published by:
Environment Agency, Horizon House, Deanery Road,
Bristol, BS1 5AH

<http://www.gov.uk/government/organisations/environment-agency>

ISBN: 978-1-84911-478-3

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Dissemination status:

Publicly available

Keywords:

Investment, decision, benefit, cost, online

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FRS18201

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Professor Doug Wilson
Chief Scientist

Executive summary

We carried out this research project to find out how we could help more people undertake meaningful early benefit:cost assessments of proposed flood and coastal risk management investment programmes. This will help increase the number of viable schemes being brought forward into the Flood and Coastal Erosion Risk Management Investment Programme. We will also be able to manage expectations of outcomes and the potential funding needs of a scheme better.

We focused on two existing tools from the Multi-Coloured Manual (www.mcm-online.co.uk), and engaged directly with existing and potential users to find out who is already using the tools, how, when and why they are doing so, and what we could do to make this easier.

We found some common themes in the feedback, which indicated the following barriers needed to be overcome:

- A lack of awareness about the tools
- A lack of clarity over when and how to apply the tools
- Insufficient understanding of the calculations used and several formatting errors within the tools, leading to a lack of confidence in the results
- Users not having the correct data to use the tools, and/or not knowing how to access and interpret that data

We used feedback collected from surveys and user groups to develop step-by-step guidance for both existing tools. This guidance is designed to help users with limited or no experience. By testing draft outputs with different groups in a workshop environment we were able to get live feedback to refine the content and make sure they are as user-friendly as possible.

All the evidence was gathered into an information pack for the Environment Agency project team to support wider training initiatives, including the development of a new training package on benefit:cost assessment.

This report explains how we went about the research, what we learned from it and how these findings have been applied to develop the guidance and other supporting information.

Acknowledgements

This study was completed with funding from the joint Environment Agency/Defra Research Programme. The project was delivered under contract order number 1070074950 to the Environment Agency, managed by Hayley Bowman, Environment Agency.

We would like to thank the contractor team at Jacobs for gathering the evidence and producing the outputs from this project, namely Petra Neve, Allison Mallows, Tim Palmer, Peter Stilliard, Aliya Hossain, Neil Blazey and Susannah Hardwick.

We would like to thank the Environment Agency project team, namely David Cotterell, Stuart Elks and Chris Smith for their contributions to the project.

We would also like to thank the several hundred people from Risk Management Authorities, consultancies, local flood risk groups and Environment Agency teams who completed the online survey, provided feedback via telephone interviews, and attended the user guidance testing workshops.

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1. Introduction

1.1 Project context

One of the objectives of the government's 25 Year Environment Plan (*A Green Future: Our 25 Year Plan to Improve the Environment, 2018*) is to reduce the risk of harm from environmental hazards such as flooding. One way the Environment Agency manages flooding is through building flood and coastal erosion risk management schemes. These are funded through a Capital Programme. The current Capital Programme runs from April 2015 to March 2021 and will reduce the risk of flooding for at least 300,000 homes.

Risk Management Authorities (Local Authorities, Internal Drainage Boards and Water and Sewerage Companies) will deliver some of the flood and coastal erosion risk management schemes under the Capital Programme. Between 2017 and 2021 these schemes will reduce the risk of flooding for around 95,000 homes. It is anticipated that projects funded and delivered by Risk Management Authorities will continue to be a significant feature of the Capital Programmes beyond 2021.

It is important that schemes submitted for the FCRM Programme are scoped realistically to increase their chances of success, and to assist in managing stakeholder expectations. Among the various tasks will be an early assessment of the potential costs and benefits to inform stakeholder discussions on funding and affordability. Scheme benefits are typically expressed in terms of the potential economic damages that could be avoided if a flood risk scheme was in place.

When developing an investment programme, it is important to be confident that the scheme will not fail once under way due to uncertainties and assumptions in the underlying data. More understanding also helps with planning, communicating what can be delivered, and delivering against the plan.

Simple, proportional approaches for calculating the potential benefits of a scheme (i.e. economic damages avoided) can help to quantify potential benefits. They can also help programme managers to make informed decisions on whether to pursue a scheme to more detailed stages of assessment. This staged approach helps avoid investing disproportionate time and expense on schemes that are not likely to go ahead.

1.2 Project objectives

The aim of this research project was to support Environment Agency and other Risk Management Authority staff in the early stages of developing investment programmes for flood and coastal risk management.

The work focused on how to help more people undertake early benefit:cost assessments, and to do them well, using two existing tools from the Multi-Coloured Manual (MCM Online, 2019) (table 1). The principal objectives were to:

1. Improve awareness and understanding of the tools

This includes understanding who is currently using them, how and when they are using them, what are the real and perceived barriers to using them more, and what could be done to increase access and make the tools easier to use.

2. Improve skills

To do this we will develop step by step guidance based on the findings of the engagement.

3. Support wider training initiatives

The step by step guidance, plus other evidence gathered throughout the project, will support the Environment Agency to develop a training package on benefit:cost assessment.

The research also established the audience for the training material, what is needed to improve capacity and skills to apply the methods, and appropriate ways to disseminate the outputs.

This project will not make any updates to the Multi-Coloured Manual tools, methods and guidance, or produce the final training material / package.

Table 1-1 describes the two online tools for early assessment of potential benefits employed in this project. These tools are included in the Multi-Coloured Manual and are accessed through the public section of the [MCM website](#).

Table 1-1 What and where are the MCM online tools?

Tool	Description	Where to find
Weighted Annual Average Damage (WAAD) tool	Spreadsheet-based tool using the Weighted Annual Average Damage method to enable users to assess the potential benefits of a flood alleviation scheme based on existing numbers of properties at risk. It uses national averaged damages at given flood probabilities for given property types. It does not use flood depth information.	MCM online – level 2 step 3 . Spreadsheet tool can be downloaded on the MCM website .
Simplified benefit:cost appraisal (BCA) tool	A benefit:cost appraisal tool for flood risk management. This tool uses average flood depths in place of detailed property level and flood depth data. It provides a mechanism to calculate an initial benefit:cost analysis of potential schemes, and a tool for informed analysis of further investment priorities	MCM online – level 3 step 3 Spreadsheet tool is downloaded on the MCM website .

We refer to these from now on as “the Multi-Coloured Manual tools”. These can be used to calculate the potential benefits of reducing flood risk to an area at a level of detail and accuracy appropriate for the very early stages of project inception and development.

However, there is a perception that uptake is low and that the tools are not being used to maximum effect. This was a key finding from an ADEPT capacity building review in 2017 which indicated that the Environment Agency could do more to support and

encourage Risk Management Authorities to make successful applications for funding, particularly by helping to build capacity in appraisal and economic assessment. In 2017 the Environment Agency agreed to produce a tailored ‘investment journey’ toolkit for Risk Management Authorities. The toolkit contains specific training resources for the Environment Agency and other Risk Management Authorities and continues to grow. One of the aims of this project was to find out what training resources would support initial benefit:cost assessment and develop initial guidance, to form part of new training resources to be developed later.

1.3 Project deliverables

The deliverables from this project are set out in table 1-2.

Table 1-2 Project deliverables

Deliverable	Description
A project report	A project report (this document) describing the project findings (including users, uses, training needs and recommendations) and work completed that can later be used to steer how we produce and disseminate the training material.
Resource pack consisting of: Literature review Survey analysis Step-by-step guidance Additional findings	Summary provided in this report ¹ Provided to the project team Provided for each of the online WAAD and BCA tools ² A supplementary information pack that can be used by the Environment Agency to develop further training or guidance to support flood and coastal erosion risk management practitioners within the Environment Agency, other RMAs and community groups, in the initial appraisal of flood risk schemes.
Project presentation	A PowerPoint presentation summarising the project findings and outputs.

¹ full review presented in Appendix A

² Provided in Appendix B

2. Methodology

2.1 Overview of approach

The approach to the research was split into two phases, with an initial preparation phase to target next steps. Figure 2.1 and the sections below provide an overview of the approach.

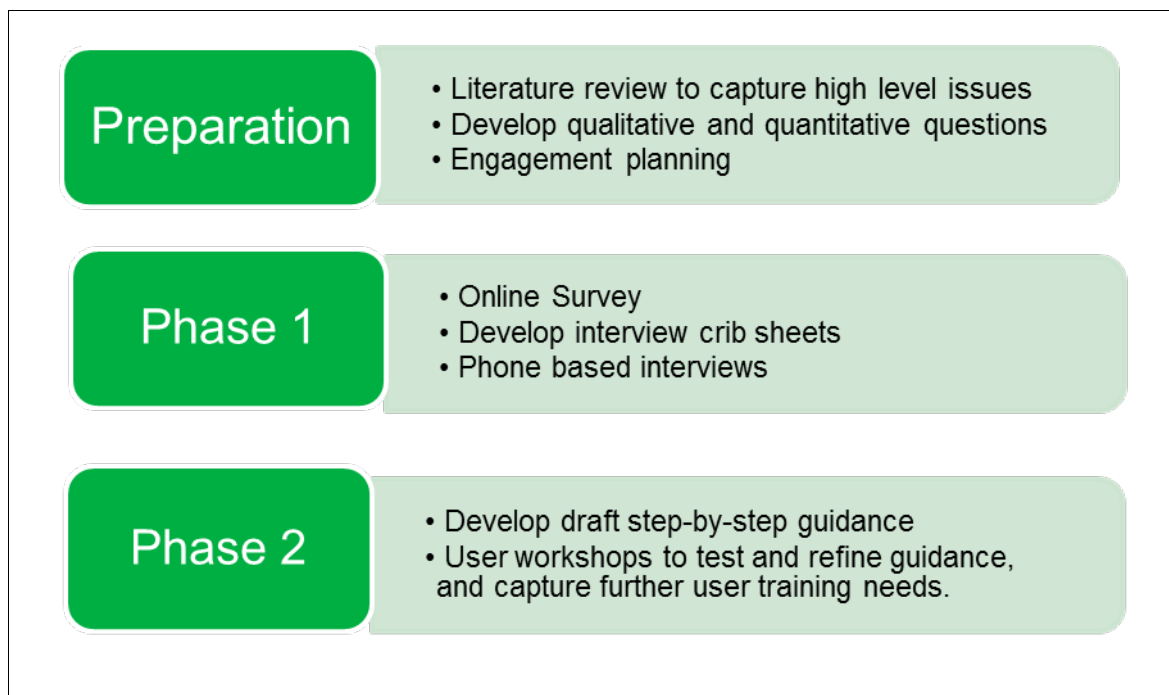


Figure 2.1: Overview of approach

2.1.1 Literature review

The research started with a desk-based study to review the existing guidance and training materials currently used to support the Multi-Coloured Manual tools. The Multi-Coloured Handbook and Multi-Coloured Manual are only accessible through subscription and thus typically used by more experienced users. The focus of this review is the freely available guidance provided on the public sections of the Multi-Coloured Manual website.

The purpose of the literature review was to target the themes and questions to explore in the Phase 1 stakeholder engagement tasks.

2.1.2 Phase 1: Survey

The project team selected an online survey as the best way to start the stakeholder engagement and identify contacts for further interview.

The questions were tailored using the information from the literature review and designed to extract information which would help address the objectives of the project.

The survey needed to address:

- Who is aware of Multi-Coloured Manual tools?
- Are the tools being used in initial scheme benefit:cost appraisal?

- If they are not being used, why not?
- Are alternative tools being used and if so, why?
- What training is available, are people accessing this, and how effective is it?
- What additional support would make it easier to access and use the tools?

To prevent people being overloaded with questions, the project team used a decision tree format, where questions are selected based on the previous answer. This minimised the number of questions asked: for example, if a respondent stated they were not aware of one of the tools they were not asked any further questions about it.

Before release, the survey was tested by the supplier team, which was not involved in the survey development.

The invitation to take part in the survey was sent to over 300 people within the Environment Agency and other Risk Management Authorities. Some were targeted existing contacts identified by the project team based on their role or involvement in related projects, and others were potential interested contacts, identified via an internet search as having a role likely to involve identifying and appraising flood risk schemes. They included flood action groups, members of the Environment Agency and Natural Resources Wales, local authority flood risk managers and drainage teams, and consultants. Of these 300, only 76 responses were received.

2.1.3 Phase 1: Telephone interviews

Two rounds of telephone interviews following the online survey helped to expand on points raised within the surveys. These also provided an opportunity to discuss specific issues with the Multi-Coloured Manual tools identified through the survey, and identify any alternative tools currently being used.

Following the survey, 17 people were identified and invited to further interviews, based on their range of experiences: of these, 8 agreed to be interviewed.

A crib sheet of interview questions was prepared to steer the discussion and assist note-taking throughout. The questions covered the interviewees' experience (if any) of the tools, how they have used them, how the tools could be improved, what barriers may be preventing people from using them, and any alternative methods they might be using.

2.1.4 Phase 2: Workshops

New step by step guidance documents were developed using the feedback from the survey and interviews. These were tested at 3 user workshops, held in Reading, Bristol and Leeds, for Environment Agency and Local Authority representatives with a range of abilities and knowledge of benefit:cost assessment.

The workshops did not review the Multi-Coloured Manual tools themselves.

3. Results

3.1 Literature review

Publicly available guidance to accompany the Multi-Coloured Manual (MCM) can be accessed at www.mcm-online.co.uk/public. The guidance is split into 3 levels, which are designed to provide a progressive introduction to flood risk management and cost-benefit analysis. The guidance contains links to both tools but does not provide specific guidance on how to use the tools.

The literature review indicated that additional, user-friendly guidance in some form is likely to help users understand and use the tools better. A summary of the key findings and recommendations are below.

Based on the literature review we developed the survey questions (section 3.2) and the 'step-by-step' guidance for each tool (Appendix B). The full literature review is provided in Appendix A.

3.1.1 Key findings and recommendations for the Multi-Coloured Manual tools and online guidance

A summary of findings and recommendations from the literature review for the existing MCM online tools and guidance:

- The Multi-Coloured Manual online guidance quickly becomes very detailed. Clearer guidance is needed to support first time users.
- The guidance in Levels 1, 2 and 3 should be sequential. This will enable a user without access to the Multi-Coloured Manual itself to acquire the information needed progressively, and to complete an assessment using the tools introduced at level 2 and 3 respectively.
- If the Weighted Annual Average Damages tool is intended to be used by novice users for simple benefits assessment, it should be introduced in Level 1.
- The Multi-Coloured Manual online guidance should provide a case study or worked example for both the Weighted Annual Average Damages (WAAD) and Simplified Benefits:Cost Appraisal (BCA) tools.
- Specific separate guidance for the Multi-Coloured Manual tools would be helpful. This should be separate to the general guidance on appraisal of flood risk management schemes.
- Within each tool, the key terms and concepts need to be explained in basic terms when they are first introduced.
- Within each tool, there should be a summary describing how the user could obtain the necessary information needed to complete the tool.
- Within the BCA tool it should be made very clear that each row of the summary results table corresponds to a potential flood alleviation scheme providing a standard of protection equal to the exceedance probability of the row, and that the costs associated with that option should be entered.

3.1.2 Wider recommendations

The wider recommendations from the literature review are:

- The Environment Agency web page for [undertaking flood and coastal defence appraisal](#) should point users to the Multi-Coloured Manual online and guidance pages.
- The context of the decision-making criteria needs to be better explained, with information such as how to interpret the results, what they tell us about the viability of a scheme, and which external criteria are not accounted for within the assessment. Users would benefit from being able to compare their assessment to real life scenarios to help them understand what constitutes a successful business case.

3.2 Survey results

The survey questions and detailed analysis of the survey results were presented to the project team. A summary is provided in this section.

The online survey was answered by 76 people with a range of experience in benefit:cost appraisal for flood and coastal erosion risk management. The survey respondents were from both the Environment Agency and Flood Risk Management Authorities. Relatively few respondents had used either of the Multi-Coloured Manual tools in practice, as presented in Figure 3.1 below.

The responses strongly suggested that additional support would result in wider use of the tools, and recommendations were given on how this support could best be provided. The key results of the survey are summarised within section 3.2.1.

Some findings from the online survey concerned changes to the tool itself, which is not within the scope of this project; this information will be collected and passed on. These are summarised within section 3.2.2.

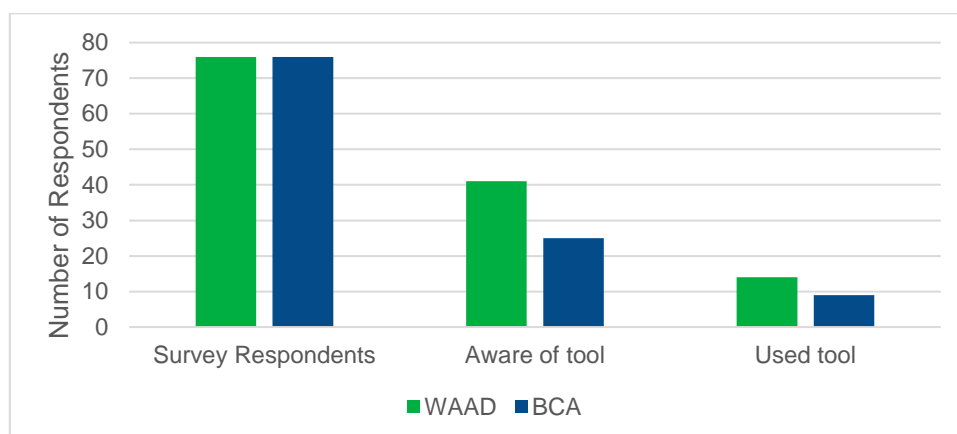


Figure 3.1: Awareness of WAAD & BCA tools

3.2.1 Key findings for the WAAD and BCA tools

A summary of the findings:

- 54% of respondents (41 people) were aware of the WAAD tool and 18% (13 people) had used it.
- 33% of respondents (25 people) were aware of the BCA tool and 12% (9 people) had used it.

- Only 3 respondents had used both the WAAD and BCA tools.
- The most common use of the WAAD tool was to identify projects for the Environment Agency capital programme, while the most common use of the BCA was for initial scheme appraisals.
- For both the WAAD and the BCA the most important factor influencing the decision to use the tools was the stage of the project.
- The top reason for not using either tool was that they had never used them before. The second highest reason for not using the BCA tool was not having the right data.
- Real case study examples of how the tools have been applied was the most popular form of support to supplement the tools. Better guidance also scored highly.
- Online training was the most popular method for distributing support for both tools.

3.2.2 Wider findings

A summary of the more general findings from the survey:

- The respondents said both tools provided only some of the information needed.
- The respondents felt the most important cosmetic improvements to be made to both tools would be to include additional guidance within the tools and links to data sources.

3.3 Interview results

The range of experience was intentionally varied across those participating in the further interviews. Some had experience using the tools, some were not aware of the tools prior to the survey or interview, and some had developed their own substitute tools.

The first round of interviews was with two people who developed their own benefit calculation tools. The interviews helped to understand why new tools were felt to be needed, and whether these were used in deliberate preference to the Multi-Coloured Manual tools.

The second round of interviews consisted of six people with a range of experience of using the tools, from only a basic knowledge of their existence to managing teams of people who use them.

All interviewees identified short-comings of the Multi-Coloured Manual tools, but there was also plenty of discussion around the potential for these tools to be used more widely in appropriate contexts and feedback on how best to encourage this. The key findings from the interviews carried out are summarised in sections 3.3.1 and 3.3.2.

3.3.1 Key findings and recommendations for the WAAD and BCA tools

Those interviewed who had experience using one, or both, tools used them for:

- Full fluvial flood risk appraisals
- At pre-feasibility stage on small-projects
- To plan the future pipeline of projects for the capital programme (online at the [Environment Agency webpages](#))

- Understanding justification of schemes. However, due to the extremely large possible range of outputs there was a limit to how useful the WAAD tool could be, since when comparing several similar schemes there is a good possibility of getting the same result for all schemes.
- Those who had used the BCA tool had used it to calculate benefits but had not used “Step 4” to calculate a benefit to cost ratio because the costs of a scheme were not known at that stage.

Those interviewed who had decided not to use one of the tools gave one of more of the reasons below:

- Tools are hard to find and not publicised enough
- It is unclear at what project stage they should be used
- Outputs are considered too low – need to add other sources of risk e.g. groundwater
- Data input required might be difficult to obtain
- WAAD tool is not clear and precise
- BCA does not cap damages at value of the property

None of those interviewed had received any training on these tools and all felt that this would be beneficial. Their suggestions on how training material should be provided were as follows:

- Worked examples of small-scale projects
- A guidance document with examples
- Establish a peer group of ‘experts’ within the Environment Agency
- Have a specific point of contact at catchment level – as most people won’t need to use it.
- E-learning/Webex that is accessible at any time
- Introductory classroom session

3.3.2 Wider findings and recommendations

Throughout the course of this project various examples of locally specific or locally developed tools were mentioned or provided to the project. A list of these has been provided to the project team.

Several of those interviewed had used alternatives to the tool as described below:

- Developed own spreadsheet – more detailed than the BCA tool, with options for different levels of detail on the input and/or output.
- Local versions of WAAD that give exact figures instead of a range – one spreadsheet focusing on residential properties and one that accounts for different types of commercial properties
- Developed own tool to calculate Outcome Measure 1 – the economic benefits. This tool is very basic and intended for people with very limited knowledge of these processes

Because these are locally developed it is recognised that they may not have been through an appropriate checking and quality assurance process, which would be required before they could be used elsewhere.

The project has not reviewed these locally developed tools. However, they could potentially be suitable alternatives or additions to the Multi-Coloured Manual tools. If these, or any other alternative tool, are to be used more widely it is recommended that a detailed review is carried out. This should carry out a detailed check on the calculations, and look at how appropriate the tool is for wider use, how up to date it is, how it will be kept up to date in the future, and any requirements for guidance notes or instructions.

3.4 Developing new step by step guidance

To enable more people to use the tools specific barriers need to be overcome. The two main barriers identified were not knowing that the tools exist, and not having the correct data (especially in the case of the BCA tool). Additionally, the findings from the online survey and the interviews clearly indicated that there is a general lack of effective training material for both tools. This means people are often discouraged from using the tools from the outset, and may default to using a locally developed tool with which they feel more comfortable.

The survey and interview participants were asked what would support them to use the Multi-Coloured Manual tools. The survey responses (below, Figure 3.2) show that example case studies and focused guidance were the most popular choices. Responses from the interviews suggested that new training needs to include a guidance document with examples, be delivered through E-learning/Webex so it can be accessed at any time, and that having a group of expert-users at the Environment Agency as the main point of contact for queries would be helpful.

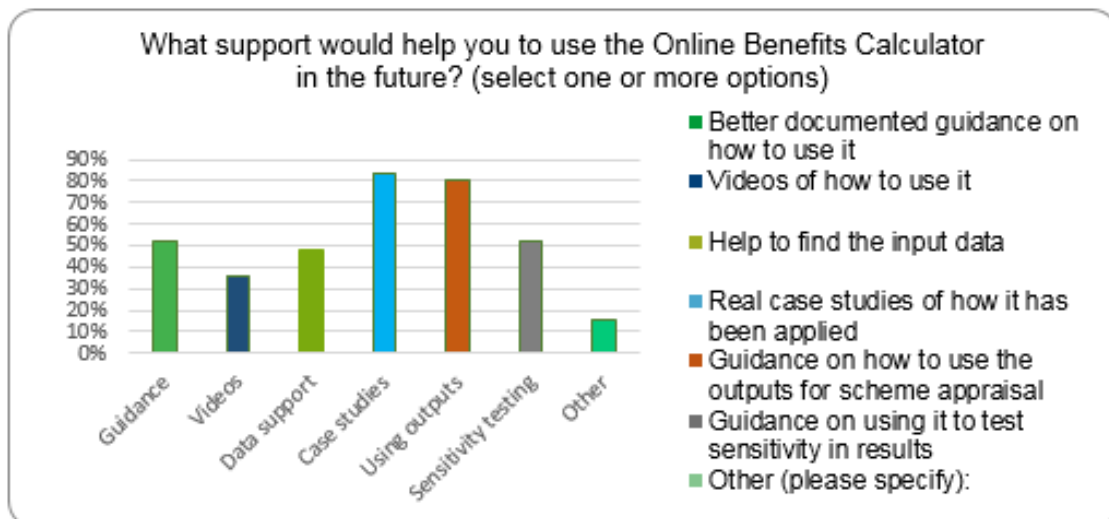


Figure 3.2: Survey response to the question "What support would help you to use the Online Benefits Calculator (BCA) in the future?"

Note: Respondents were asked to select one or more options, thus the percentages in Figure 3.2 add up to more than 100 percent.

Based on the responses, step-by-step guidance documents were produced to accompany the tools. The documents are set out so that each main "Step" within the

tools is detailed on a separate page and split up into sub-actions with reference notes throughout. The documents aim to provide a clear guide for completion of the tools, explanation of key concepts required for their use, and some context on what the tools are for. These are provided in Appendix B.

3.5 Testing the guidance at user workshops

In total 29 people from the Environment Agency and Local Authorities attended the three workshops.

Each workshop began with an introduction to the project and the two Multi-Coloured Manual tools. The groups were then asked to test the new step by step guidance. Data and information for three example case studies were provided on the day. Attendees were asked to work through the guidance in pairs using the data and instructions provided. Each group had printed copies of the guidance to use and capture comments and members were encouraged to have an open discussion throughout. Members of the project team were on hand to offer support and collect feedback.

The guidance was updated after each workshop to incorporate the feedback. This meant the guidance was improved on a continuous basis, and prevented the same comments being made at each workshop.

The general opinion of the WAAD tool and guidance was that the tool itself was reasonably straightforward and the step-by-step guidance (following some minor wording changes) explained the steps clearly. The main concerns were about how useful the outputs are, and the circumstances in which this tool would be used.

Commentary on the BCA tool included similar points to those raised around the WAAD concerning scenarios in which this tool would be used, and how to apply the outputs. Another key concern about the BCA tool concerned how and where to get the input data needed to complete the tool, and how detailed the instructions should be in the guidance, given that there are different ways data may be collected and prepared. In general, the BCA tool was considered complicated to use without supplementary support. There were various additional comments picked up about wording, visuals and structure which were updated within the step-by-step guidance following the workshops.

The key findings from the workshops regarding the WAAD and BCA guidance documents are summarised in section 3.5.1 below.

Section 3.5.2 presents the workshop findings concerning suggestions for further work to be done that does not directly relate to the step-by-step guidance documents produced.

Following the workshops, comments were collated and addressed.

3.5.1 Findings and recommendations for the WAAD and BCA tools

Workshop findings relating to the WAAD tool and step-by-step guidance (Appendix B) were as follows:

- The WAAD tool is relatively straightforward to use and the guidance (following minor wording changes) explained the steps clearly.
- The main concern was the banding of outputs into very broad ranges (the range of total benefits outputted are: £0M, £1M–£5M, £5M–£10M, £10M–£50M, £50M–£100M, £100M–£500M and £500M+). This results in a high likelihood that one or more options, particularly for smaller schemes, will fall within the same results band. The difference between £1M of benefits and £5M of benefits is highly

significant to many organisations, therefore classifying the results in this way does not support effective decision making. It is important that the tool is used only at the early Strategic Level and to test whether there is a potential scheme, and not necessarily to compare multiple schemes.

- The method of counting properties suggested within the tool (using the Environment Agency Long Term Flood Risk Maps) is not practical and no one in the workshops would be prepared to use this method. This is due to a difficulty in defining property boundaries, difficulty in being able to distinguish between residential and non-residential properties, and a lower confidence in the flood outlines compared to modelling that can be found elsewhere. All attendees would use the Environment Agency EasiMap2 system or similar GIS to get an accurate and quick count of the residential and non-residential properties within the area.
- Further information is required to explain when this tool should be used rather than the BCA. In response a general guidance page has been developed (Appendix B)

Workshop findings relating to the BCA tool and the step-by-step guidance (Appendix B) were as follows:

- Overall, the guidance was thought to be straightforward and easy to use.
- Some of the more complex elements of the assessment needed clearer explanation, such as:
 - Accounting for negative depths up to a certain limit
 - Selecting the correct damage values from the depth-damage curve
NOTE: Since study completion this has been amended in the Benefit Cost Analysis tool in May 2019 to automatically select the damage value corresponding to the depth entered, as a response to feedback provided to FHRC. The depth-damage curve data has been updated to 2019 and the date is labelled in the tool.
 - Updating discount factor according to scheme life
NOTE: Since study completion this has been amended in the Benefit Cost Analysis tool in May 2019 as a response to feedback provided to FHRC.
- When the tool is first opened, it is pre-completed with a worked example. This was not obvious, and many users thought that this data should be retained, or that it was a previously used copy that had been completed. It needs to be clear what data needs to be removed from the tool so that incorrect data is not carried forward into a new assessment.
- Many elements of the tool itself are not user-friendly, which means that even with the guidance highlighting which cells needed to be edited it is not immediately obvious to the users. This needs to be as clear as possible in the guidance.
NOTE: Since study completion this has been amended in the Benefit Cost Analysis tool in May 2019 as a response to feedback provided to FHRC.
- Three graphs are automatically produced on the final page of the tool (Step 4). Unless you have eight modelled annual exceedance probabilities, these graphs are skewed and are difficult to interpret. They add no value, as all information within the graphs is also within the table, and users found this confusing. These graphs should be removed from the tool.
NOTE: Since study completion this has been amended in the Benefit Cost Analysis tool in May 2019 and the second and third graphs have been removed as a response to feedback provided to FHRC.

- There needs to be clear information within the guidance on how the results can be fed into a Partnership Funding Calculator.
- There needs to be clear information within the guidance on how sensitivity tests can be carried out.
- Further information is required to explain when this tool should be used rather than the WAAD tool. In response a general guidance page has been developed (Appendix B).

3.5.2 Wider findings and recommendations

The wider findings and recommendations from the workshops are:

- A cover page that describes the scenarios in which each tool could be used would be helpful. This would allow the user to choose which tool to use based on the level of information they have, and the stage of the project. A general guidance page has been developed (Appendix B).
- There is a large amount of work required prior to using the BCA tool to obtain the necessary input data in the correct format. Most attendees at the workshops were unaware of how to do this. Although the data was provided in a readily usable format for the workshops, questions were raised throughout about how the users could source and process this information themselves. Separate guidance and training may be required for people on how to obtain and prepare the required data for use in the tool.
- Following the workshops there were a few more examples of local tools passed on from attendees:
 - A version of WAAD that also includes damage to cars and outputs a single benefits figure rather than a wide range.
 - A Benefits Calculator tool with different steps depending on the data available and detailed instructions within the tool. Option to include vehicular and evacuation values.
 - A Benefits Calculator which allows properties to be written off where the flood risk is 1 in 2yr or worse.

A list of these locally developed tools is provided to the project team. As noted previously, it is recognised that these alternative tools may not have been through an appropriate checking and quality assurance process, which would be required before they could be used elsewhere.

3.6 Updating the guidance based on user feedback

The feedback from the workshops was reviewed and used to update the guidance (once after each workshop, and then a final iteration).

In summary, the feedback from the workshops was that the guidance documents were easy to follow and that the step-by-step approach was the best way for people to be guided through the tools. However, three main questions were raised throughout:

- How does the user obtain the required data for input into the tools?
- What does the user do with the results?
- How does the user know when to use the WAAD tool and when the BCA tool?

These key issues were addressed in the step-by-step guidance as follows:

- A decision tree has been developed for the user to decide which tool is appropriate for their scenario. This decision tree splits the tools based on the stage of the project and the type of data already available to the user. (Appendix B)
- An introduction page at the front of both guidance documents summarises what the tool does and what information is required to use it. This allows the user to understand whether the tool is suitable for their scenario immediately. The introduction to the BCA guidance also refers to the WAAD tool so that users are aware of an alternative option if they do not have the right data for the BCA.
- Where input data is needed, interactive links show where that data can be accessed online. There is also a full page in the BCA guidance which describes how the user can get the input data including property numbers, flood depths and multiple modelled annual exceedance probabilities. There are several ways that this can be done, and the page gives some instructions which the user can apply to their scenario.
- On the last page in both guidance documents there is a summary of what the user can do with the results. This includes how to understand the results, how to carry out sensitivity tests and whether the results can be put straight into a Partnership Funding Calculator.
- Informative notes have been provided throughout the guidance documents, as well as a glossary at the end of the BCA guidance to explain key concepts, for example 'discount factors' and the attribution of damage costs to negative depths. These were based on areas of confusion raised within the workshops.

The final versions of the step by step guidance documents are in Appendix B.

It was clear that a worked example accompanying the guidance would help any new users. This would give them confidence that they could obtain the correct information and would provide a practice scenario to allow users to get comfortable using them. The workshops used this method successfully. The scenarios prepared for the workshops could be provided as supporting material alongside the guidance. This material will require some further 'how-to' explanation to facilitate self-study.

4. Conclusions and Next Steps

4.1 Conclusions

The Multi-Coloured Manual tools (the “MCM-Online-Public-WAAD-Tool” and the “MCM-Online-Public-Simple-BCA-Tool”) provide two methods to quantify benefits. These two tools are available to everyone. However, they are not well publicised, and the sample survey of potential users indicates that the majority are unaware the tools exist. In its current state, the WAAD tool supports a simple, quick assessment of the potential benefits. The BCA tool is also a straightforward assessment, however, the work required to get the data needed for carrying out this assessment needs more specialist skills and the outputs can be confusing. For many respondents it is not clear what the results can be used for.

Other reasons why the tools have not been used widely are that they are not user-friendly and contain some confusing, misleading and poorly worded instructions. For example, the BCA tool appears to give a precise assessment of the potential benefits caused by use of numbers with many decimals, though conversely, a lack of transparency in the calculations within the tool creates low confidence from the user in the results generated.

The survey and interviews provided an indication of the low level of experience people have with these tools, and suggest that potential users would benefit from additional training or guidance. A step-by-step guide was the preferred method of providing this support, ahead of other options such as in-house training or video training. Step-by-step guidance enables a user to work through the tools in their own time as needed, and at their own pace.

Once the guidance documents had been developed they were tested at user workshops (section 3.5). The guidance was well received. The people who attended the workshops found that the guidance documents helped them use the tools and understand how the outputs are reached. User feedback was incorporated following each workshop to further refine the guidance for the next workshop, maximising the benefit of these sessions. Whilst the guidance is comprehensive for instructing users through the Multi-Coloured Manual tools, obtaining and processing the base data may require further detailed guidance and training.

The final guidance documents are provided in Appendix B. These guidance documents provide a base which can be referred to by users with any level of experience.

4.2 Next steps

4.2.1 Awareness Guidance documents

The main reason why the Multi-Coloured Manual tools are not widely used was that potential users were not aware that they existed. A fresh drive to promote the tools, via the new training resources and guidance documents, will help encourage Environment Agency and Risk Management Authorities to access and use them. This may also reduce the number people developing their own local tools.

4.2.2 Guidance documents

It is recommended that the format of the guidance documents be changed from PowerPoint to a more usable format, such as an interactive PDF. The content of the documents is sound, but the attractiveness and usability could be improved by

implementing this change. This would also make it easy to incorporate the worked examples used at the workshops.

The guidance documents have been produced to form part of other training resources being delivered by the Environment Agency under the Investment Journey Framework. When developing these resources, the feedback from the survey should be noted. For example, instruction videos could be produced to provide a visual walk-through demonstration of the guidance.

4.2.3 Review of Locally Produced Tools

Several locally produced tools have been identified during this research. Many of these tools are currently preferred by local area teams and aim to combine the functionality of both the WAAD and BCA tools. These should be fully reviewed and quality assured so that, if suitable, they can be used more widely. Additionally, any features that are found to be especially user-friendly, or offer additional functionality beyond the existing Multi-Coloured Manual tools, could be recommended as additions to the WAAD and BCA tools.

4.2.4 Multi-Coloured Manual tools

We recommend that the Multi-Coloured Manual tools themselves are updated to make them more user-friendly and accessible. Basic aspects of the BCA tool especially seem to have not been proof read (for example, instructions ending mid-sentence or inconsistent and inappropriate numbers of decimal places), which undermines the user's confidence in the tool.

The updates should consider the functionality of the locally developed tools and make similar improvements to ensure they are effective and user-friendly.

NOTE: Since study completion the Benefit Cost Analysis tool has been updated in May 2019 based on feedback provided to the Flood Hazard Research Centre.

Appendices

FRS18201/R Appendix A: Literature review and analysis

FRS18201/R Appendix B: User guide for early calculations of potential scheme benefits

References

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List of abbreviations

ADEPT	The Association of Directors of Environment, Economy, Planning and Transport. The association represents Place Directors from county, unitary and metropolitan local authorities, along with Local Enterprise Partnerships (LEPs).
BCA	Benefit:Cost Appraisal
BCR	Benefit:Cost Ratio
FCERM	Flood and Coastal Erosion Risk Management
MCM	Multi-Coloured Manual which sets out the Weighted Annual Average Damage method.
WAAD	Weighted Annual Average Damage

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