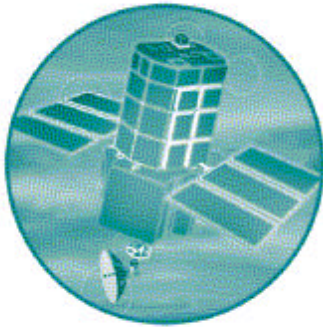


DEFRA/Environment Agency Flood and Coastal Defence R&D Programme



Improving the Implementation and Adoption of Flood and Coastal Defence R&D Results

Technical Report W5G-003/TR

Improving the Implementation and Adoption of Flood and Coastal Defence R&D Results

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R&D Technical Report W5G – 003

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Statement of Use

This document provides policy and management recommendations and guidance to DEFRA, the Environment Agency and other stakeholders on the actions to be taken to improve the implementation and adoption of results from their Flood and Coastal Defence R&D.

Key words

Implementation, dissemination, research, development, flood, coastal, defence, uptake.

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COMPANION TOOL: ‘Route Map for FCD Project Managers’ – CD-ROM.

GLOSSARY

CPD = Continuing Professional Development.

ERSE = End of Research Stage Evaluation.

FCD = Flood and Coastal Defence.

ICT = Information and Communications Technology.

Knowledge Management = The processes that govern the creation, dissemination and utilisation of information.

PRP = Performance Related Pay.

Joint R&D Programme = The Joint DEFRA/Environment Agency Flood and Coastal Defence R&D Programme.

R&D Programme Co-ordinators = The two DEFRA or Environment Agency Officers who have accountability for the two parts of the Joint R&D Programme

Route Map = A guide to the processes, procedures and tools that may be used in achieving an objective. In the context of this study, the objective is the implementation and adoption of outputs from the Joint R&D Programme.

SET = Science, Engineering and Technology.

Uptake = The collective activities of dissemination (making available), implementation (taking up) and adoption (using) of new products. To be effective must include stopping using old methods.

NOTE Following the change from MAFF to DEFRA, references to MAFF in the text have been changed to DEFRA EXCEPT where a reference to a report that was produced by MAFF is made.

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EXECUTIVE SUMMARY

The Department for Environment, Food and Rural Affairs (DEFRA, formerly MAFF) and the Environment Agency commenced a new Joint Flood and Coastal Defence (FCD) R&D Programme in April 2001 following the recommendations of their independent Research and Development Advisory Committee. A key aim of the new Joint R&D Programme is to focus on user needs and to ensure that the intended benefits of the R&D projects are delivered. To achieve this, the Research and Development Advisory Committee had identified various management, organisational and cultural issues to be addressed in order to improve the implementation and adoption of research.

This report investigates these and other apparent issues that need to be addressed. It recommends actions that should contribute to improving the uptake of the results from the new Joint R&D Programme, and to realising the expected benefits. The study has included:

- A review of FCD R&D processes, organisation, outputs, management systems and guidance used in R&D work.
- Consultation, through interview, with over 40 individuals representing key organisations involved in FCD R&D, including a workshop to discuss and prioritise the key issues.
- Development of communication strategies and a tool for identifying how best to disseminate and implement diverse types of R&D.
- Early discussion of results to bring improvements forward in the programme.

Our investigation enabled a picture to be built up of the constraints to effective uptake of FCD R&D and an understanding of the success factors that would help to overcome these. In summary the constraints related to (a) R&D systems and culture, (b) organisational and institutional systems and culture across the FCD industry, and (c) individual learning and personal development issues - common to many other professional areas.

A series of key actions have been developed to improve the implementation and adoption of FCD R&D results. Some of these actions are already being carried out either as a result of this study or due to other changes within DEFRA and the Environment Agency. Overall, we recommend that, in relative terms, more resources should be allocated to R&D uptake (i.e. passive dissemination and active implementation of R&D results as distinct from the research itself). Some actions link into the wider issue of developing a national FCD training programme, and should not be borne solely by the R&D Programme.

The recommended actions are summarised overleaf. It is suggested that one-off costs to the R&D Programme (e.g. design and creation of a Flood and Coastal Defence R&D web site) are accommodated by deferring some research projects by a month or two if the additional resources cannot be made available. These costs are estimated at £60k. Most of the other costs will need to be accommodated within the individual project budgets – in particular the requirement to carry out an implementation plan for each project. The additional recurrent cost to the R&D Programme of the recommendations is approximately £30k per annum, while all users should invest in additional training and CPD.

Summary of recommendations

Recommended Action	Outcome	Resources
1: Provide specific support for uptake (dissemination, implementation and adoption) of FCD R&D.	Better focus for all generic issues related to the uptake of R&D outputs. Better planning of R&D outputs and uptake.	Consolidation and enhancement of present R&D Management and Science support posts for the Joint R&D Programme. This will cost £30k per annum. Associated support costs could be £20k per annum.
2: Agree an Implementation Plan for the delivery of each R&D output.	implementation of R&D outputs linked into defined user activity or response.	Already incorporated into standard Agency and DEFRA procedures - simply reinforces what should be done anyway.
3: Prepare, involve early, and train users for delivery and use of R&D outputs.	Users ready and prepared to use new R&D output.	Budgeted through the R&D project, or through related business or training budgets.
4: Provide R&D Project managers with easy to use guide to R&D uptake – a “Route Map”.	Improved uptake of R&D outputs by clarifying the process and enabling Project Managers to make better decisions in planning uptake.	Initial training to DEFRA, Environment Agency and other stakeholder staff will cost £5k. Further maintenance and support will be provided by the new post.
5: Enhance techniques and skills used in managing and producing FCD R&D outputs.	FCD R&D outputs easier to obtain and adopt, and are produced more efficiently.	Main resources used are the new uptake support post (1. above).
6: Use new information and communications technology (ICT) to assist the uptake processes.	More accessible and easier to use R&D outputs. New outputs will be available at the desktop.	Provision of FCD web site - £50k over 6-9 months. Use of new ICT and web updates should be considered and budgeted for in every R&D project. Budget needed for site maintenance.
7: Develop improved links between software, models and tools and FCD R&D.	Increased efficiency in DEFRA, Operating Authorities and Joint R&D Programme through use of software, models and tools.	Budgeted through the R&D project. Most relevant to Broad-scale Modelling, Engineering, Flood Forecasting & Warning, and Risk & Uncertainty Themes.
8: Use demonstration and pilot projects to enhance the R&D uptake process.	User ownership. Outputs from R&D projects will have been properly tested with users prior to general uptake. Lessons learned fed back into the R&D process.	“Add-on” activities should be built into existing R&D projects, other FCD projects and operations activities. Consider also a project to provide guidance on use of pilot and demonstration projects (cost £15k).
9: Provide environment and incentives to encourage mainstream staff to keep up to date with current practice.	Development of a “learning culture” which will provide engagement with the R&D process and enhance uptake.	Developed jointly between users’ managers and Joint R&D Programme Co-ordinators. With Agency, carried out as part of the Human Resources “change project”. Training budgets of DEFRA, Framework Consultants and Contractors, and Operating Authorities should be sought for support.
10: Develop an improved image for DEFRA and Environment Agency R&D.	Higher profile and good image of R&D within FCD Industry, Users well engaged with the R&D process with good understanding of the benefits of R&D outputs.	Driven by the FCD R&D Co-ordinators in DEFRA and the Agency. Some actions by the new uptake post holder with support from with existing DEFRA/Operating Authority staff (e.g. Public Relations, Newsletter Publications, etc).
11: Nurture centres of expertise to provide advice and support services in applying R&D knowledge.	Use of R&D outputs is made more effective by providing “one stop shops” for information, training and technical support.	Utilise currently recognised “lead organisations”. Further resources following development of EA and DEFRA Science Plans.

1 INTRODUCTION

1.1 R&D uptake

Research and Development (R&D) has the potential to provide significant benefits to Flood and Coastal Defence (FCD). Ensuring that results of R&D projects deliver their potential benefits is a challenge for all involved in FCD - R&D managers, researchers and future users of the results. To date this process has often relied on passive dissemination of results which may not be effective on its own. More active approaches are needed, tailored to the requirements and characteristics of different user communities, to ensure that the output from any project achieves the desired outcome.

This study was initiated by DEFRA and the Environment Agency to identify the factors limiting the effectiveness of R&D uptake and to develop solutions to facilitate effective dissemination, implementation and adoption. The study builds on the Report of the Advisory Committee on Flood and Coastal Defence R&D (MAFF 1999, commonly referred to as the Penning-Rowell Report) which identified a range of issues contributing to poor uptake of R&D (see Appendix 1). These included: management, organisational and cultural issues within the different groups involved in FCD R&D and its uptake.

The Advisory Committee report also identified key principles for improving uptake of FCD R&D. These have been reviewed and extended by this study to cover all of the relevant issues in the uptake of FCD R&D. This work reflects a detailed investigation of the issues, as well as recent and ongoing initiatives within DEFRA and the Environment Agency, in particular it seeks to facilitate the better engagement of FCD practitioners in the uptake process.

Outcomes – the changes that result from the implementation of an R&D output.

Outputs - the physical “product” from an R&D project (e.g. a report, guidance note or model).

Uptake – the collective process of dissemination (making available), implementation (taking up) and adoption (using) of R&D results.

1.1.1 Joint Flood and Coastal Defence R&D Programme

Key recommendations of the Report of the Advisory Committee on Flood and Coastal Defence R&D were that the R&D activities of DEFRA and the Environment Agency should be combined into a joint programme, and that it should focus on user needs. This new programme has adopted a thematic structure with six themes representing different aspects of Flood and Coastal Defence policy and practice, together with related underpinning knowledge. Each Theme is led by a DEFRA or Environment Agency appointed Theme Leader who is advised by a Theme Advisory Group (TAG) of practitioners and researchers having particular knowledge and expertise of the subject concerned. The Joint R&D programme is intended to support all FCD Operating Authorities.

1.2 Study objectives

The overall objective of this study was:

To identify, and recommend a plan for setting up, a user-oriented framework and related services for the effective implementation and adoption of R&D results and other related information from the Joint DEFRA/Environment Agency Flood and Coastal Defence R&D Programme.

Specific objectives for the project were:

- To identify the main factors currently limiting the effectiveness of uptake of the results of R&D (see Appendix 2).
- To categorise the different types of uptake and user involved with the Joint R&D Programme (see Sections 2.2 and 2.3).
- To produce a Route Map for guiding R&D managers when considering the uptake requirements for any particular R&D project (see Section 4.4 and companion tool Route Map).
- To recommend a preferred structure, style and management approach for a web-site for the Joint R&D Programme (see Section 4.6 and Appendix 3).
- To recommend model approaches to implementation of R&D outputs by key user groups (see companion tool Route Map).
- To identify other approaches and/or services (internal or external) for assisting uptake which could be set up and/or made available (see Chapters 3 and 4).
- To propose a programme of additions and modifications to the current DEFRA and Environment Agency uptake procedures and mechanisms (see Chapter 3 and 4).
- To produce a plan and supporting notes and specifications for introducing the various improvements in uptake for the Joint R&D Programme.

For the full Terms of Reference for this study see Appendix 4.

All individuals and bodies who have been involved in this study support the need for collective action to achieve improved uptake of R&D results. For further details of those involved in the consultation process during the study, see Appendix 5.

2 CONTEXT OF CURRENT RESEARCH AND DEVELOPMENT PRACTICES

2.1 External change and context

Significant change has taken place over recent years, and is continuing to take place, within the area of Flood and Coastal Defence. Some of this change establishes the context of any recommendations to improve the uptake of FCD R&D results. These changes include:

Organisational change with the establishment of DEFRA and also the new organisation structure for Flood Defence in the Environment Agency following the Easter Floods in 1998. This impacts on the values and attitudes of research users and managers.

- *Consultants' and Contractors' Frameworks*, established by the Agency to deliver significant improvements in the efficiency of the planning, design and construction of its Capital Programme in Flood Defence, and in the production of Flood Risk Mapping.
- *Policy changes*, such as the development of a more strategic approach to flood management and the new planning guidance on development in flood plains. This impacts on the types of computer-based products needed by R&D users.
- *Skills issues*, particularly the need for the FCD industry to take a more co-ordinated approach to staff training and Continuous Professional Development (CPD). In particular, the Institution of Civil Engineers (ICE) has drawn attention to the need to take collective action to address the skills shortage (*Learning to live with rivers*, ICE 2001). This points to the needs (supported by this study) for a national framework for training and CPD in the FCD industry.
- *Changes to user culture* with the Environment Agency's *Vision* (Environment Agency, 2000) and the approaches being adopted in its implementation under *Making it Happen* (Environment Agency, 2002). This includes a widespread process-based approach to achieving good practice and continuous improvement.
- *Changes in knowledge management*, particularly through the public sector's commitment to e-Government. In the R&D sector, this is reflected in the expectation that R&D Outputs will, wherever possible, now be available in electronic format over the web.

In developing the recommendations, we have differentiated between actions that are wholly within the remit of the Joint R&D Programme (e.g. an FCD R&D website) and actions that link up with wider initiatives driven by others (such as industry-wide training). It was clear that the study recommendations must link into current and future changes in the FCD industry if the opportunities for improvements in dissemination, implementation and adoption are to be maximised.

Uptake classification: uptake can be classified into two subgroups that help the R&D findings to be adopted. These cover both the passive dissemination of R&D results (e.g. in a technical journal) and the active implementation of R&D results (e.g. through training):

Dissemination includes:

- Publication of R&D results – in print, on video, or through electronic media, conferences or seminars;
- Publication of information on the Joint R&D Programme – e.g. a listing of projects currently underway and planned for the future, or Research Newsletter;
- Publicity on specific projects – e.g. press articles, television coverage;
- Reminders to users that new R&D outputs are available; and
- Marketing and sales of outputs to users.

Implementation includes:

- Take up of R&D results by the intended users e.g. through an instruction or training;
- Interactive seminars, visits and workshops to raise awareness of users and improve their understanding of R&D results;
- Training and CPD courses in the use and application of R&D outputs; and
- Application of R&D results through pilot studies and demonstration projects.

2.2 Flood and Coastal Defence R&D users

Flood and Coastal Defence R&D users include all who use the results of the Joint R&D Programme. The main users of FCD R&D are staff from DEFRA, the Operating Authorities (including Environment Agency, Local Authorities and Internal Drainage Boards), consultants, contractors, universities and research organisations. Policy makers in other Government bodies, non-governmental organisations and the general public are secondary users. It is also important to recognise that policy makers and practitioners outside England and Wales will take a keen interest in the outputs from the Joint R&D Programme. All have potential expectations of the availability and utility of outputs; delivering information at the appropriate level and the right format to the different groups that have an interest in any project can present a considerable challenge for the R&D manager.

Within these groups are people with different levels of both experience and technical understanding in Flood and Coastal Defence (for example new graduates, mid-career practitioners and chief executives). These users have different requirements of R&D projects, but the most common are:

- Information to support development of, or changes in, policy;
- Guidance on planning and implementation of FCD strategies;
- Tools and techniques to plan and design FCD schemes or works;
- Operational guidance;
- Information on environmental (natural) processes;
- Detailed information feeding into further research; and
- Information to promote understanding of the R&D programme and its successes.

Although most R&D projects are planned to meet one of these needs, the results may also be used for a second or third purpose. For example, a project on sustainable drainage designed to produce operational guidance may have relevance for architects and developers and also be of interest to policy makers, site maintenance contractors and researchers.

These user groups will require different types and levels of information from the project in appropriate format(s) and with different degrees of training. In general, the present approach to uptake of FCD R&D results means that targeting and planning of R&D outputs to meet different user requirements is only achieved in a limited way. As a result the uptake of results can be only partly successful due to poor targeting of users (i.e. identification of different groups), as well as poor delivery (e.g. training in use). Obviously a compromise may need to be struck so that outputs serve more than one user group.

2.3 Current uptake routes in Flood and Coastal Defence R&D

A conclusion from the FCD Research and Development Advisory Committee Report (1999) was that:

"As a guideline, ...a minimum of 5% should be spent on managing research dissemination and take-up (about £275,000 p.a.)"

The extensive consultation carried out under this study confirms that too few resources were being committed by MAFF and the Agency on R&D uptake at the start of the Joint R&D Programme (April 2001). There is a clear need for additional expenditure on R&D uptake as identified in the FCD Research and Development Advisory Committee Report (1999).

Following the publication of the Advisory Committee Report and the start of the Joint R&D Programme, positive steps have been taken to improve basic dissemination, for example through the R&D support services in DEFRA and the Environment Agency. However, it is still the case that too few resources are committed to the delivery of the results in a proactive manner to users. Consequently, in practice, there is a "gap" between how the results are delivered and how users could best receive them. Often, neither the Joint R&D Programme nor users are committing resources to this – not for training, piloting or CPD.

The issues of supporting uptake therefore largely remain, although some of the immediate recommendations (e.g. for web-based dissemination) identified at the start of this study are now being carried out.

2.3.1 Flood and Coastal Defence R&D Themes

Flood and Coastal Defence R&D Themes:

Flood and Coastal Defence R&D is now organised into six major themes, each led by a Theme Leader supported by a Theme Advisory Group. These themes are:

- Fluvial, estuarine and coastal processes;
- Policy development;
- Broad scale modelling;
- Flood forecasting and warning;
- Risk evaluation/understanding of uncertainty; and
- Engineering.

The Joint R&D Programme is structured in six thematic programmes as outlined above. This structure enables stakeholders (principally researchers and users) in FCD R&D to get involved in the development and management of relevant research programmes. Thus the Theme Advisory Groups (TAGs) and below them the various Networks, Topic Groups and/or Project Steering Groups provide an important means of planning and checking that user needs are met. It is, of course, important to manage this involvement of users and researchers so that the level of contact is sustainable.

2.3.2 DEFRA (policy makers and strategic development)

DEFRA's current uptake arrangements involve distribution of the R&D outputs (generally reports) within DEFRA and to external organisations or individuals. Major reports are now posted on the DEFRA website. The six-monthly *FCD Research Newsletter* is widely circulated both to the FCD industry in England and Wales, and to contacts in other countries. R&D users are required to contact DEFRA or the Research Contractor if they wish to receive a copy of any report. General enquirers will be sent a project summary (CSG15) and those making specific requests will receive a copy of the report from the Chief Scientists Group (CSG) or the Research Contractor. Dissemination of R&D outputs is therefore carried out by DEFRA CSG and the R&D Contractor. Implementation is generally left to the Research Contractor to follow the approach indicated in the research plan for communication of results.

In general the focus in the delivery of R&D within DEFRA has been delivery of the report rather than its uptake, and this remains an issue with the current R&D process. The contract management process identifies the need for research contractors to produce reports in the appropriate form, but does not objectively secure the necessary skills or strategies to achieve this. A current initiative from the CSG group is designed to partially overcome this by ensuring that R&D reports, produced from 2001 onwards, are available on its website.

DEFRA FCD also holds an important *Annual Conference of River and Coastal Engineers*, widely attended by a diverse range of users, which includes dissemination of key R&D findings through presentations and conference papers. R&D results that feed into policy through Project Appraisal Guidance Notes (PAGN) obviously get implemented. A PAGN may also refer the user to specific R&D outputs. DEFRA has identified the "guru"/champion approach as a potential aid to uptake, recognising the value in using contacts outside the Department to promote R&D findings and projects, however this has not yet been actively pursued by the Department.

DEFRA has only been established since June 2001. Its emerging culture and management style are likely to continue the further development of open approaches to R&D uptake.

2.3.3 Operating Authorities

The Environment Agency

Systems and procedures

Among the Operating Authorities, the Environment Agency has by far the greatest number of FCD users hence its direct involvement in the management of the Joint R&D Programme. It has developed management procedures aimed at facilitating R&D uptake.

These procedures include:

- An approach to project development that encourages early consideration of implementation by requiring the inclusion of information on delivery of benefits in the project authorisation process.
- The provision of assistance to R&D Project Managers, particularly in the management of R&D studies, through R&D support staff and specific R&D management tools such as the computer-based research management manual.
- The End of Research Stage Evaluation (ERSE) process that focuses on the uptake process and the delivery of benefits. On completion of the R&D contract, the Project Manager must compile the “ERSE Package” to get the project signed off. This requires compilation of the product descriptions, dissemination list, implementation plan for the R&D outputs, and confirmation of the anticipated level of benefits to be obtained from these.
- The R&D Dissemination Centre at WRc Swindon - this currently delivers paper copies of R&D outputs to end users specified in the ERSE Package. The Dissemination Centre maintains a web-based information service and on-line purchasing. This service is due for retendering in 2002 to provide both electronic (web-based) and paper-based outputs. Information on FCD R&D outputs is now given in the joint DEFRA/Environment Agency Research Newsletter.
- The Environment Agency intranet may be used to provide summary information on the project to staff (although this is not always the case).
- The Environment Agency, like DEFRA, also recognises the use of champions to promote R&D projects and findings and to improve implementation and adoption.

Actual approaches to taking up R&D, like pilot projects or training, are developed on a project-by-project basis and are not carried out in a standard way. There is, therefore, a range of approaches to the actual process of taking up the results of R&D (e.g. training seminars) as distinct from the process of dissemination.

Example of good practice in uptake of R&D:

Thames Region of the Environment Agency makes a member of the flood defence team responsible for keeping up to date with developments in R&D. This practice is effective because the team member is interested in R&D, and the line manager allocates time for this activity. This ensures that the team has an identified source of up to date information on R&D and that the team member's performance evaluation is not adversely affected by this activity.

While the need to identify users is recognised within the research management process, this is not always carried through into the production of outputs designed to meet their needs and into an effective process of implementation of R&D results. Provision of support to Project Managers via the research guidance and the R&D support staff is not able to address this issue fully as this requires detailed understanding of users and their needs. R&D Project Managers have little written guidance on how to plan the best approach to delivering the output to the user.

Experience shows that uptake of the R&D output is best where a clear driver for change exists – such as a policy requirement or an efficiency gain. In general, FCD dissemination

is focused internally within the Environment Agency – this needs to develop better links to other stakeholders in FCD (e.g. consultants and other Operating Authorities).

A number of initiatives have been initiated that promise to assist the effective uptake of R&D. These include:

Initiative	Benefit to uptake of R&D
Implementation of Agency <i>Vision</i> , and Agency Management System (AMS).	These help to underpin the culture of being a learning organisation, and adoption of a process-based approach to achieving continuous improvement in FCD practice.
Reshaping application of science to the Agency’s business activities.	This will help to secure a culture of using science and innovation across the Environment Agency to achieve improvements, in particular through designation of lead scientific or technical contacts.
Implementation of Communications Strategy and Knowledge Management Strategy.	This will provide focused communications and improved knowledge management (including developments in electronic publishing, internet and intranet) for disseminating R&D outputs.
National Contractors and Consultants Framework Agreements.	Partnering agreements with Agency give opportunities for profiting through achieving high efficiency and cost savings in planning and design tasks through application of R&D products.
National Capital Programme Management (NCPM) Service; National Flood Risk Mapping programme.	These national programmes are able to specify the tools (e.g. software) to be employed by Flood Defence consultants. This enables the implementation of some R&D outputs to be specified across the board for use in planing and design of FCD schemes.

Resources

The Environment Agency and DEFRA commit major resources to the Joint R&D Programme. The budget in 2001/02 is approximately £3.8M. We estimate that less than 5% of the 2000/01 budget was allocated to uptake activities. In general, Agency staff are not able to commit significant time to learning about new R&D outputs outside the immediate context of their work. The Agency does have R&D support resources (in terms of guidance and support staff) but these are not in themselves able to achieve effective uptake, since this is a two-way process with the user.

Local Authorities

Systems and procedures

Local Authorities have a responsibility to act with diligence in carrying out Flood Defence works. Therefore, they need to receive information from, and feed into, the Joint R&D Programme. The main mechanism for this is through the LGA Technical Advisory Groups and, to a lesser extent, through their representation on TAGs, Topic Groups and Project Steering Groups. Their Shoreline Management Plans (SMPs) make recommendations on R&D, but at present these are held by the relevant Regional Coastal Group, not centrally, and the recommendations are not linked together.

A potential driver for improved dissemination to Local Authorities is the Government’s drive for introducing “e-Government”.

Issues and resources

Local Authorities have limited resources to commit to funding R&D activities. They also face difficulties in uptake of R&D particularly in making time available for this. The problem is compounded by the profile of staff employed – many are near to retirement and

have few staff to whom knowledge can be transferred. Changes in Local Government are resulting in a skills and knowledge loss in many authorities. It is, therefore, critical for this group of users to have total access to information both for the experienced practitioner and for less experienced replacements.

It was clear that Local Authority staff would like to have involvement in shaping the Joint R&D Programme but there is a lack of volunteers able, or willing, to get involved. This is partially because practitioners have had negative experiences in the past and partially because of the time and other commitments they have.

Dissemination is currently a slow and unstructured process in Local Government. The delivery of R&D outputs to the correct staff can be “hit and miss” with information often being forwarded to the Chief Executive or Technical Engineer who may not be the correct target user.

A key need for this group of users is for R&D to focus on ‘Development’ and updating of good practice, rather than the underlying ‘Research’. Clarifying the emphasis on uptake as part of a project would make a significant difference to this group if delivered to them in suitable form and with due recognition of the limitations on their resources. The DEFRA Annual Conference and professional journals are seen as key routes for dissemination at present. Time is an issue here too, as the conference is run over three consecutive days and this time out of the office may be difficult to arrange. The R&D newsletter is also considered to be very appropriate and is circulated well. This creates the awareness of R&D in this user group but actual changes in practice are less likely to be realised unless there is direct involvement through a particular scheme. Pilot and demonstration projects can, therefore, be particularly useful in this group.

Demonstration of direct involvement of Local Authorities:

The benefits of direct involvement were demonstrated through a workshop on the use of rock in coastal engineering where many Local Authorities have been innovative in their approaches and applied the latest research findings. The challenge is for this approach to be achieved in all aspects of their Flood and Coastal Defence works.

Internal Drainage Boards

Systems and procedures

Internal Drainage Boards (IDBs) adopt a variety of approaches in linking in to FCD R&D outputs. There is a strong operational, and local, focus on the work carried out by IDBs. To this end, uptake best focuses on the adoption of relevant, tested, R&D outputs by technical staff. Large IDBs engage full time technical staff and smaller groups may contract work out as required or may belong to a group of boards who can then act as a consortium.

Issues and resources

In many ways IDBs face similar challenges to those faced by Local Authorities in the uptake of R&D. Their ability to adopt new practices is dependent on staff having the opportunity and willingness to spend time on learning about R&D outputs. The local emphasis of their work means R&D must be demonstrated to be locally applicable. In

addition, as they are responsible for drainage, rather than flood defence as a whole, only part of the outputs from Joint R&D Programme are relevant to them.

The varied arrangements adopted by IDBs can mean that it is difficult to ensure that R&D information is consistently passed to the right person, either within the IDB or the organisations carrying out contract work. Information needs to be provided at the right level to ensure understanding of R&D outputs within the IDB boards and that the more detailed technical information is readily available for technical staff and consultants.

2.3.4 Consultants and contractors

Consultants are major users of the outputs from the Joint R&D Programme as a significant part of the programme focuses on issues relating to the planning and design work that they carry out. Contractors obviously benefit from R&D outputs that influence good construction practice – an increasing sector of the programme. Consultants and contractors are linked actively to the Joint R&D programme in three main ways:

- They participate in relevant TAGs and project structure (where the latter exists), and can thus feed their experience into the R&D process topic groups and projects.
- They may be linked closely to the Environment Agency under the Framework Agreements which requires participating organisations to actively promote knowledge/sharing, and to improve efficiently through innovation and adoption of best practice.
- They actively use the outputs in carrying out assignments for DEFRA and Operating Authorities.

Many consultants have Chief Engineers or Technical Directors who act as gurus within their firms for a specific area of expertise, such as hydrology or geotechnics. These people are responsible for keeping up to date with scientific and technical developments in their area of expertise, and for making others in their firm aware of these developments. They are often part of a matrix management system, where they provide technical leadership, and project directors provide project leadership. Project staff are expected to be proactive in calling on the expertise of the appropriate Chief Engineer or Technical Director for all but the most routine work. For this system to be effective, specialists charged with keeping up to date with scientific and technical developments must have sufficient time - away from project work and other time-bound responsibilities.

Consultants and contractors are also moving towards knowledge management systems (see Section 2.3.4), particularly through intranet development where key technical information can be accessed by all staff.

Example:

Chief Engineers working at Halcrow Group are expected to spend 10% of their time on technical updating activities. The Chief Engineer role epitomises the “personalisation” strategy in that a specific person within an organisation is known, both within and outside an organisation, as having expertise in a particular area or areas and is thus a key contact point.

2.3.5 Researchers

The researcher forms an essential part of, not only the R&D project, but also of the overall FCD R&D system. As a group they are a limited, but skilled resource, that need to be engaged within the R&D process to ensure their experience and views of uptake of R&D are utilised properly and that the body of FCD knowledge is built up and utilised in a consistent manner. As FCD is a specialist area, researchers cannot simply be regarded as a resource that is turned on or off when the customer wishes.

Researchers are also able to feed into the Joint R&D Programme through their involvement in the TAG, topic groups and project steering groups. Many researchers have faced the challenges of dissemination, implementation and adoption, and have sound ideas and views on what might be successful approaches.

The research community is also a major user of R&D in the so-called science base that underpins the more user-orientated Joint R&D Programme. They will have views on their requirements from R&D projects. They may be quite specific (interest in a part of an R&D project, or particular data) where it is relevant to their specialised areas of research. These academic researchers can progress research outside the Joint R&D programme that will feed back into the programme at a later point in time. It is important, therefore, that they understand the issues FCD faces. Significant progress has been made within the new Joint R&D Programme in establishing an effective dialogue (such as the Concerted Actions, Scoping Studies and the Networks established jointly with EPSRC) between academic researchers and those working directly in flood and coastal defence. These provide a mechanism for a two-way flow of information.

Academia's drivers for research are wider than those of DEFRA and the Environment Agency. Academic research drivers may be more focused on advancing the boundaries of knowledge in the science base and, consequently, the Joint R&D Programme will not wish to engage equally with all academia having interest in FCD issues.

2.3.6 Training and professional routes

Linking the uptake of R&D outputs and information to industry-wide training, personal development and professional qualifications can be an extremely useful way of disseminating information and implementing R&D results. Many of the professional engineers involved in flood and coastal defence works have Chartered status through a relevant institution such as the Institution of Civil Engineers or the Chartered Institution of Water and Environmental Management. These institutions promote training, study and research to advance standards and practice. They also carry out a wide range of dissemination activities through, for example, meetings and conferences. These are now linked to Continuing Professional Development (CPD) programmes designed to maintain, improve and broaden the knowledge and skills of their members.

Training courses provide an effective means of both introducing the results of R&D to practitioners at the end of an R&D project, and ensuring that the knowledge created by any particular project is embedded into the knowledge base of industry. This has been particularly effective where regular training courses now exist on FCD issues (for example,

by HR Wallingford in River Engineering, and the Agency's induction training in Flood Defence provided by Middlesex University).

Because staff training and CPD have not been strongly formalised in FCD, it has not been easy for R&D projects to deliver their outputs into a well-established industry framework, and indeed culture, for training. It is a clear challenge for FCD in the future to establish clearer linkages and mechanisms here.

Use of CPD:

Practitioners are increasingly both interested and required to participate in CPD activities. As a result CPD activities provide a clear mechanism for disseminating information on FCD R&D outputs directly to technical practitioners, as well as providing a forum for feedback to those undertaking R&D studies on end-user requirements.

2.4 Measurement of uptake

Much of the evidence for poor R&D uptake is anecdotal. The MAFF Flood and Coastal Defence (FCD) Research and Development Advisory Committee Report (1999) report refers to a telephone survey of past research, which indicated "patchy" uptake of results. The precise form and extent of this survey has not been available to this study.

Measurement of passive uptake processes is relatively simple, but does not give in-depth information on whether users are implementing R&D results. Measures of passive uptake processes include the number of reports distributed, the number of web site hits, and the number of "opportunities to see" (readers multiplied by the number of press articles).

Measurement of active uptake processes is more difficult, and generally relies on some form of impact assessment (a questionnaire or telephone survey) where users give information on whether a particular R&D output has changed their practices. Other measures of active uptake processes include the number of mentions in contracts and the number of training days association with a particular R&D output.

3 GENERAL APPROACHES TO IMPROVING UPTAKE OF R&D

3.1 Communications theory and Knowledge Management

Poor uptake of R&D is a generic issue. Flood and Coastal Defence is not the only sector affected by this. As discussed in the following sections, the need to sustain and develop the skills base of FCD staff is a key issue. It is recognised by the *Learning to live with rivers* report (ICE 2001). We believe there is a range of generic approaches that may be used to improve practice in the uptake of R&D outputs that have relevance to Flood and Coastal Defence. These include the broad development of communications theory and Knowledge Management together with the more specific recent communication activities carried out within the Construction Industry and the NHS (described in more detail in Appendix 6 and 7). We have summarised these here before making specific recommendations for FCD improvements in Chapter 4.

3.1.1 Communications theory

Communications theory can be an extremely useful tool in assisting the development of successful approaches to the dissemination, implementation and adoption of R&D. It can be used to help develop an understanding of the issues relating to the communication and receipt of information (see Appendix 6). In doing so, it also enables the identification of issues in the existing systems that are used for R&D uptake and their potential solutions.

The communication process requires a message to be sent (dissemination of the findings) which the receiver will interpret. They will respond to the message that they receive. A series of steps have been adopted in developing the recommendations put forward in order to secure effective communication. These can be summarised as follows:

- Identify the target audience;
- Determine the communication activities;
- Design the message;
- Select the communication channels;
- Establish the promotional budget;
- Decide on the mixture of promotional activities to be carried out;
- Measure the results; and
- Manage and co-ordinate integrated communications.

Communication strategy examples:

Several examples of innovative communication strategies have been identified from the Construction Industry and the NHS that are relevant in developing improved FCD R&D implementation and adoption (see Appendix 7). The approaches have been reviewed and relevant lessons identified. These include:

- The Construction Best Practice Programme;
- The Movement for Innovation and rethinking construction;
- The Knowledge Exchange and Co-Construct;
- Partners in Innovation;
- R&D Uptake within the NHS; and
- CIRIA practitioners-led approach.

3.1.2 Knowledge Management

Knowledge Management (KM) methods also provide several key messages for improved R&D uptake. These include the development of a culture of sharing of information, possibly assisted by tools such as intranet systems, with support from top management and the introduction of incentives to share and learn. Again, these messages have been adopted in developing the study recommendations.

Knowledge Management

This is supported by effective means of obtaining information, coupled with positive culture that provides incentives for sharing and learning.

3.2 Overcoming constraints to implementation and adoption

When considering any improvement, the initial focus is often on the current constraints. These could act as barriers to success and need to be understood to be able to recommend improvements to existing approaches with confidence.

A wide range of potential constraints to effective uptake of DEFRA/Environment Agency R&D (see Appendix 2) were identified through consultation with those involved in FCD R&D and consideration of a wide range of DEFRA and Environment Agency documentation. (see list in Appendices 5 and 8)

The three main types of constraints identified were:

Constraint	Difficulty in overcoming constraint	This study's role in easing the constraint
Constraints arising from DEFRA and Environment Agency R&D systems and culture.	Low	Propose a programme of additions and modifications to current DEFRA and Environment Agency uptake procedures and mechanisms.
Constraints arising from organisations and institutional (DEFRA, Environment Agency and other Flood and Coastal Defence Operating Authorities and their consultants and contractors) systems and culture.	Medium to High	Highlight other change initiatives (DEFRA, Environment Agency or external) that will contribute. Make sure the leaders of these initiatives buy into the R&D uptake implications of their work. Identify gaps (constraints that are unlikely to be eased by existing initiatives).
Constraints to individual learning and CPD that are common to many professional organisations and individuals working with them.	Medium to High	Highlight existing changes and other initiatives (DEFRA, Environment Agency or external) that can contribute to improved learning. Make recommendations for additions and modifications to current DEFRA and Environment Agency approaches to encourage and support individual learning.

Some of the constraints have been known about for some time, others apply only to particular groups or sectors. Some may have been overcome in examples of good practice, or are being addressed as DEFRA and the Agency as the Flood and Coastal Defence sector continues to develop and evolve its practices. The extent to which particular constraints now apply is therefore variable, particularly as there has been so much change within FCD.

We therefore believe it is important to focus on creating the right future conditions for effective uptake of R&D rather than labouring on the past.

3.3 Success factors for implementation and adoption

The FCD Research and Development Advisory Committee Report (1999) identified four key requirements to achieve successful implementation and adoption of R&D results:

- More accessible information: full dissemination of research results (not least through the Web and other technologies);
- Better co-operation between researchers and users;
- More compulsion to use research results; and
- Setting performance targets and standards and involving researchers and practitioners in meeting these standards.

It is also essential that sufficient resources are made available to facilitate effective uptake, both generally for the Joint R&D Programme and, specifically, for each project. This includes the development of efficient organisational and management structures directly aimed at achieving uptake rather than simply focussing on R&D management. The above requirements for successful R&D uptake have been considered alongside all the other issues identified within this study, including the constraints as discussed in Section 3.2 and Appendix 2.

The resulting lists of general success factors for achieving effective R&D uptake are given below. These offer a real potential for improving the dissemination, implementation and adoption of R&D and as such have been embedded in the recommendations as laid out in Chapter 4. The success factors have been categorised into three groups related to particular aspects of the R&D process as shown in the following sections.

3.3.1 R&D systems and culture

The review of the implementation and adoption of R&D external to Flood and Coastal Defence, has identified a series of success factors that can benefit uptake. These are listed below and the recommendations presented in Chapter 4 are designed to build them into the FCD R&D management system as part of the administration process (e.g. through the R&D Management Manuals and forms as well as being reviewed and promoted by TAGs, Theme Leaders, R&D project managers, support staff, research contractors and project champions). This will help to ensure that these positive factors are clearly incorporated into R&D Management, and that they are a demonstrable part of R&D studies with the required skills being available within project teams. The success factors and their benefits are tabulated overleaf:

Success factor	Value/benefit
A focus on outcomes rather than outputs .	Ensures that an R&D project has the intended effect rather than, for example, providing an output that might have the required effect if the end user implements it properly. This needs to be part of the general culture of R&D with the outcome of individual R&D projects being clearly identified as the proposal is developed.
A clearly defined demand for the research work.	Ensures that R&D has a clear policy or operational value or contributes some clearly required knowledge. This should be identified as a project proposal is developed and monitored as the study takes place.
A champion <u>for the research</u> .	Promotes the benefits of the R&D in terms that the future users are able to understand and relate to. (The champion can also help those carrying out the R&D to understand relevant user-related issues but should not necessarily be involved in the detail of the project). The champion should be involved from the start of the project.
A champion or clear business user <u>for the application</u> of the output.	Helps new users of R&D outputs to overcome inexperience and achieve successful implementation. The champion should be involved with a study from inception to implementation and adoption.
An appropriate “message” for the outputs.	Helps the end-user to have confidence in the research findings and in their use. The messages will need to be produced as appropriate throughout the life of an R&D project and must be: <ul style="list-style-type: none"> • Valid, to ensure that the end users are not immediately put off using the results of R&D. • Clear when to apply the outputs and when not to. • From a respected source so that end users are attracted to the R&D and believe that it will provide benefits. • Disseminated using appropriate channels so that end users receive relevant information and are not "bombarded" with inappropriate detail. • Targeted so that the right information reaches the right people in an efficient manner. • Launched at an appropriate time to ensure that enthusiasm for a new approach is capitalised upon successfully or dovetails with other initiatives. • Updated when necessary to maximise the efficient use of current best practice.
An appropriate “message” from the research outputs.	Helps the end user to understand exactly what an R&D output does and how it can be used operationally. It is essential that this is developed properly as an R&D output is completed and implemented and includes: <ul style="list-style-type: none"> • Pilot and demonstration studies to test, publicise, and prove R&D results, thus providing direct benefits to operational activities. • Clarity about what processes have to be altered to ensure efficient implementation of new processes and tools. • Identification of relevant potential barriers to uptake and plans to overcome them to ensure smooth uptake and to provide a check that the R&D outputs will provide the benefits anticipated. • Clarity about specific actions and uses of R&D results – guidelines, educational programmes, etc to ensure appropriate, and successful use.

3.3.2 Organisational and institutional systems and culture

Success factor	Value/benefit
Leadership, vision, and senior management commitment to continuous improvement and innovation.	Helps ensure that staff to feel enthused and comfortable about using R&D outputs and participating in training activities. This should be part of the general culture of FCD.
Incentives (requirements, rewards and recognition) for people and organisations to adopt improved (more efficient or effective) methods of working.	This will directly encourage participation in training and adoption of good practice and will foster a clear context and demand for R&D outputs.
Professional staff need time and space to learn to use as improved practice (includes new R&D outputs).	This enables operational staff to learn how to use new R&D outputs when they become available and allows efficiency gains and greater productivity.
Promotion and recruitment of people who will be innovative and expect to utilise improved methods.	Helps to generate and sustain a wider culture of innovation and learning. This is relevant to the whole R&D process as staff will expect to utilise R&D and will be better champions of outputs.
A knowledge-sharing culture with informal and formal networking systems.	Helps to ensure the efficient transfer of information to others and generate interest, understanding and enthusiasm for innovation. Particularly important when transferring knowledge from researchers to users.
Linking R&D uptake courses to training courses and personal development.	Provides long-term context for many R&D outputs, especially if linked to professional development activities such as institution related CPD. Helps to provide well structured training courses available for R&D outputs as they become operational tools.

3.3.3 Individual learning

Success factor	Value/benefit
Encouragement of personal development, through personal appraisal, objectives and PRP. This could include subscribing to “investors in people” programmes, to assist people to continually improve themselves.	Encourages the individual to learn, develop and feel committed to training and learning new methods (as provided by R&D outputs).
Identification of need (through personal appraisal) and provision of training opportunities to be acted upon.	Helps to promote engagement by individuals with training programmes as they will feel that it is responsive to their needs in both content and timing.
Support for people to help them develop new and appropriate methods of working, and move away from defensive reasoning patterns (e.g. ‘I’ve done it this way for thirty years’), for example through facilitated “lessons learned” sessions.	Helps to develop a culture of innovation, continuous improvement and a more open-minded approach to new ideas by identifying how new approaches may improve the job.
Allowing sufficient time for learning and training needs.	Enables an individual to understand a new idea/approach and to implement it effectively without feeling that it is a constraint on other objectives.

The above success factors are particularly important in placing implementation and adoption of R&D into the general culture of continuous improvement and the learning organisation. They allow practitioners to focus on personal development and to become more open and able to adopt new tools, ideas and approaches. They can also have beneficial effects to the R&D process as a whole, since if the user community has a more positive approach to R&D they will then be keener to input into the R&D process itself.

4 RECOMMENDED ACTIONS TO IMPROVE IMPLEMENTATION AND ADOPTION

This section sets out the specific recommendations that have been identified, through this study, to improve the dissemination, implementation and adoption of R&D. The provision of generic support (see Section 4.1), the creation of a 'Route Map' (see Section 4.4) and provision of a web site (see Section 4.6) are considered the most important direct actions to be undertaken. Other significant actions have been identified which will contribute to improving the context of R&D uptake, such as a culture of continuous improvement.

Whilst some actions may be carried out immediately their impact may not be realised for several years. Other actions, however, will have an immediate effect. Actions identified as medium term should still be recognised as significant to R&D uptake. Some actions will require broader changes in FCD (e.g. in training and learning culture).

The recommendations span the three generic areas of constraint and success discussed in Chapter 3. Individually, they may contribute to success across the three different areas. Also indicated are the resources expected to be required to bring about the actions. The specific amount and way in which resources are allocated and managed is a matter for DEFRA and the Environment Agency to consider. The recommendations have sought to consider both organisations' development activities and strategies (see Appendix 8).

4.1 Generic support for improved uptake

Recommendation: Specific support should be provided for the uptake of FCD R&D.

Benefit: The development of a focus on the generic issues relating to planning, production and delivery of outputs will enhance the effective uptake of R&D outputs and ensure that future outputs are better planned from the outset. This step links into many of the other success factors identified in Section 3.3. In particular, it will help to promote consistent messages for and from research, and to ensure that the mechanics of output production and delivery is done in an informed and co-ordinated manner.

Resources: Provision of a support post will cost £40-50k per annum. A budget for implementation and adoption should be allocated at £20k per annum (to be reviewed after 1st year to determine necessary increase/decrease) for on-going projects that do not currently have an allocation for this. The new post may fit within the Environment Agency or DEFRA R&D support group, but will need to link to both organisations. Final details of where the post will fit will need to be resolved by the Agency and DEFRA. Other resources for uptake of new projects must be allocated on a project-by-project basis.

4.1.1 Budgets for R&D dissemination (immediate action)

Currently not enough resources are allocated to the uptake of project results in R&D project budgets. This failure to secure funding for the delivery of projects means there is poor value for money from resources spent elsewhere in the project process. Extra expenditure will be a good investment if it ensures that R&D results are more effectively taken up. Often, the preferred type of product delivery costs more to achieve than just printing a report. This does not necessarily mean an overall increase in R&D budgets but, rather, better use of the same budget on fewer projects.

It is recommended that £20k is allocated specifically for R&D uptake for existing projects which do not have specific funds allocated to them for uptake. This will also support any necessary (but additional) work needed to deal with uptake across broad areas of work (e.g. a Theme). Also, while the general dissemination methods can be identified at the start of a project, the specific requirements of the implementation plan can often not be confirmed until the project is complete.

The Route Map (Section 4.4) will help managers to identify the approach and products needed for R&D uptake and will thus allow budgets to be set for specific project activities. This may be possible by coalescence of linked-project budgets but some general funds should also be made available if the benefits of proper uptake are to be achieved.

Support to underpin dissemination:

The major need for underpinning the dissemination of best practice – which is widely admitted by practitioners - could be supported through a variety of mechanisms including:

- A national Training Programme managed within FCD and involving the Joint R&D Programme, but including other groups e.g. the Agency's Framework Consultants. This could follow the Construction Industry's Co-Construct model, with a single gateway to a group of training providers that might include key Universities, HR Wallingford, CIRIA, CEH Wallingford, and consultants.
- Influencing other organisations (such as CIWEM, and ICE) to deliver the findings of the joint programme (linked to other activities). This could link in with developing initiatives such as the Environment Agency's Human Resources strategy and should involve all FCD stakeholders. It could be piloted, for example with CIWEM, to test the potential of such an approach on a restricted topic area.
- Using other established groups to lead the training programme such as the Technical Development Group of Framework Consultants and/or Technical Advisory Group of the LGA. Again detailed plans would need to be developed with these groups and the potential of such an approach on a restricted topic area tested.
- Individual organisation's staff training and development programmes can be used to identify training needs and hence create demand for training in specific areas.

Of course it should not always be necessary for the R&D budget to pay for all the dissemination and implementation costs. Other budgets – e.g. training, business function, or another change project - may be used. Linking project budgets for joined-up uptake of R&D results can provide savings over a “single-project” approach. Defining where the

boundary exists between the end of an R&D project and the start of another activity will need careful consideration. For example, in implementing the findings of a major R&D project, it may be necessary to include some dissemination activities within the project budget and to establish a long-term plan for routine training and support for the use of the R&D output.

4.1.2 Creation of uptake support post (immediate action)

The handling of R&D outputs at present is not done efficiently. A range of tasks – vital to the efficient and well-executed production and delivery of project outputs – are allocated to the Research Contractor while they could be done more effectively by a DEFRA/Agency officer. We found a lot of time was spent rewriting reports to meet requirements “internal” to DEFRA/Environment Agency and reformatting to meet output specifications.

Specific support and advice about planning, production and delivery is vital for FCD Project Managers and their Research Contractors to be effective in the producing and delivering R&D projects. Currently the basic management of procedures and basic dissemination is supported by the R&D services of DEFRA and the Agency. However, the time and particular skills of this role in being familiar with user needs and delivery mechanisms are not yet available within the group.

To overcome this, we recommend creating a new post that is specifically dedicated to support the production, dissemination and implementation of the outputs from the Joint R&D Programme. The post could fit within the Agency’s R&D Service group at Westbury-on-Trym (near Bristol and also location of CIS, Education and other National Services), but will also need to link to DEFRA and could be a part of CSG. Precisely where the post holder should be placed will need to be resolved by DEFRA and the Environment Agency.

The general skills required by this post will include a good understanding and appreciation of communication practices and techniques, and relevant experience and understanding of the production of outputs/publications (including electronic media). A number of the recommendations in the following sections build on this post. Establishment of this post is, therefore, critical to ensuring that the recommendations of this study are taken up.

Obviously work done by this post will reduce the workload on other R&D support staff. However, it will not reduce the overall workload so significantly as to create funding for a whole FTE.

It is envisaged that the post holder’s role will evolve over time. As current R&D staff become more conversant with uptake, there will be less need for support and advice. However some support will always be required for new staff that may be inexperienced in managing R&D projects. Once this stage has been reached the post holder will be able to concentrate on other tasks. In developing training and similar issues, the new post holder must ensure that this work is carried out in an integrated way within the whole DEFRA/Environment Agency structure and not separately.

New support post job specification:

The post holder will need to operate at a high level and be able to provide a professional and credible service on the following:

- Provide advice and support for R&D Project Managers in assessing the skills and resources required within the project contractor's team for uptake of the R&D (and advice and support when reviewing tenders) to improve the balance in research contractor teams;
- Help Theme Leaders identify appropriate links between R&D Projects (and other relevant R&D) to promote synergy and the development of joint approaches to uptake of R&D outputs;
- Provide advice and support on written quality, design, and branding used in R&D outputs to promote, and to improve, R&D uptake;
- Provide advice to Project Managers on the production of R&D outputs and maintain essential contacts between the Joint R&D Programme and the Agency R&D Dissemination Service;
- Maintain Route Map contents and liaise with R&D/ICT services to implement updates to ensure that the route map remains an up-to-date tool and to maximise its use;
- Maintain and support the standard guidance and specifications for the production and delivery of outputs;
- Act as business owner for the Joint R&D Programme Web-site;
- Maintain and identify key pathways/contacts for uptake (e.g. to local authority staff) to ensure that electronic and paper based R&D information and outputs are circulated effectively to operating authorities and other users to promote uptake;
- Act as a link point with the Agency and DEFRA training officers to secure best training context for R&D; and
- Liase with Theme Leaders as they carry out monitoring of uptake to determine the effectiveness of FCD R&D and to identify areas for improvement of all aspects of uptake (processes, systems, techniques).

4.1.3 Resources for generic support

We estimate that the support post will cost £30k per annum and that the implementation and adoption budget for existing projects will be £20k per annum (to be reviewed after 1st year to determine necessary increase/decrease). The new post holder should monitor this percentage over its first year of introduction and feed back the results of this monitoring to those responsible for setting R&D budgets.

4.2 Implementation plan

Recommendation: The R&D Theme Leader should agree an Implementation Plan for the delivery of each R&D output, or group of outputs.

Benefit: A clear agreement between the users' representative and the Joint R&D Programme.

Resources: Already incorporated into standard Agency and DEFRA procedures - this reinforces what should be done anyway. Some increase in Project Management time may be expected.

4.2.1 Link the uptake of R&D outputs into clear user activity or response

The sign-off procedures in DEFRA and the Agency for FCD R&D projects should be discussed and agreed between the DEFRA/Agency Science Groups, R&D Co-ordinators and the Theme Leaders to ensure that a clear line of approval exists for the Implementation Plan.

The Implementation Plan sets out – for each R&D output, or group of outputs - the responsibilities, budgets and actions for delivering the R&D output (i.e. implementation and adoption). Without this there is no clear agreement between the user and the Joint R&D Programme. As stated earlier, the R&D manager cannot do everything to ensure effective uptake. For the Agency, the Implementation Plan links into the continuous improvement of the business process within the Agency Management System. In some cases the use of a particular manual or software product will be mandatory – e.g. a requirement in the consultants' job specification.

4.3 User preparedness – including training

Recommendation: The Implementation Plan for each R&D output, or group of outputs, must address measures needed to prepare the user for delivery of the output.

Benefit: Actions will be put in hand in good time to prepare the user for receiving the output – in many cases this will involve training.

Resources: To be budgeted through the R&D project, or through related business or training budgets.

4.3.1 Ensure users are equipped and ready to utilise R&D outputs (immediate-medium term action)

Like the Implementation Plan, this recommendation is self-explanatory. However, it is an action on the user's side and as such can easily be overlooked. Every project will have one or more user representatives who must advise on the level of training appropriate in "adopting" the new output into use. It is important to dovetail the training related to the introduction of new products with the ongoing training needs of the user in the business area in which the output is used.

4.3.2 Improving the use of training for uptake (immediate–medium term action)

DEFRA and the Agency should build the Joint R&D Programme fully into current and emerging arrangements for training in Flood and Coastal Defence practice. In particular, this should include actions taken following the ICE report on *Learning to Live with Rivers*. Links between R&D uptake and training have been discussed in Chapter 3.

A range of existing mechanisms for training exists in the different user sector – all can be used or built upon. It is also increasingly clear that a national FCD training programme could be created and built up with the involvement of universities, users (e.g. Agency, consultants etc) and the professional bodies. The current skills shortage in the FCD industry

is a key driver here. Such training could be run both as short modules and as an MSc or similar longer qualification course. Development of training should be led by the user side (e.g. the Agency's training section) but with input from the Joint R&D Programme. It is easy to see how the delivery of some projects could dovetail into such a course – particularly if they deliver standard software or manuals.

There are good examples of short training modules in Flood Defence staff induction (Middlesex University) and in geomorphology (University of Newcastle-upon-Tyne). Such courses could be adopted for all Operating Authorities. For some projects, the training must be purpose-designed for delivering the particular R&D output.

It would also be possible to build on aspects of the Annual DEFRA Conference and CIWEM Rivers and Coastal Group Conference to provide regional activities. This would be of particular benefit to Coastal Groups and could be based on their areas of interest and that of CPD from Regional CIWEM and ICE branches. The annual DEFRA Conference of River and Coastal Engineers is widely respected as a means of keeping users up to date with new developments.

As discussed in Section 3.2, the learning culture of the user is a key driver that will enable the delivery or use of R&D outputs to be linked into training and Continuing Professional Development (CPD) programmes.

It is important in the short-term to consider making funding available to (re-)implement and (properly) disseminate recent projects where implementation plans may not have been identified. This will logically follow from the Concerted Action Process (building on the Theme Leaders review of their areas) whereby all Theme Leaders should have identified areas in which present knowledge is not yet properly assimilated into current practice. This should enable a realistic and targeted budget.

4.4 Route Map

Recommendation: R&D Project managers should be provided with a computer-based guide to the implementation and adoption of R&D – a “Route Map”.

Benefit: The uptake of R&D outputs is improved by clarifying the processes concerned. Project Managers are then able to make more effective decisions in planning uptake. This will ensure that information is more accessible and that the appropriate messages are delivered in a form that is focused on outcomes, particularly through the improvements of R&D systems.

Resources: Initial training to DEFRA/Environment Agency staff will cost £6.5k. Further maintenance and support will be provided by the new post (see Section 4.1.2).

4.4.1 Route Map (immediate action)

At present the lack of consistent guidance to Project Managers on what actions should be taken to improve uptake means that the best decisions on uptake are not always made, and even when they are, the decisions are not necessarily taken in the most efficient or effective manner.

The adoption of the Route Map (see enclosed CD), therefore, is an essential first step to ensuring uptake is improved. It is important to provide Project Managers with clarity on responsibilities for implementation – the Route Map does this by establishing a logical process for R&D dissemination and implementation, coupled with advice on communication and marrying products and output types to different project types.

The Route Map (see Figure 4.1) is a passive tool to guide Project Managers in taking decisions on the issues relevant to implementation and adoption of R&D from Project inception to outcome. The guidance provided within the Route Map is generic, at a high level, and based on existing processes in DEFRA and the Environment Agency. It does not go down to the level of detail contained in DEFRA or Environment Agency Project Management Systems (e.g. the DEFRA R&D Handbook), it is designed to work alongside these systems and link in logically with them. Similarly it does not repeat specific detailed guidance on the definitions of product formats for the Joint R&D Programme.

The approach increases the focus on project outcomes rather than just the outputs, and guides Project Managers in their decisions through a project life. It also provides pointers to where support can be obtained and hence how support services may be utilised in aspects of the project work.

As explained earlier, this is not to give all implementation tasks to R&D Project Managers and officers. Outputs intended to influence operational practice, for example, must identify a lead officer responsible for implementation with the business or process ‘owner’. Theme Leaders should assist in confirming involvement of individuals or groups in the implementation and adoption plan.

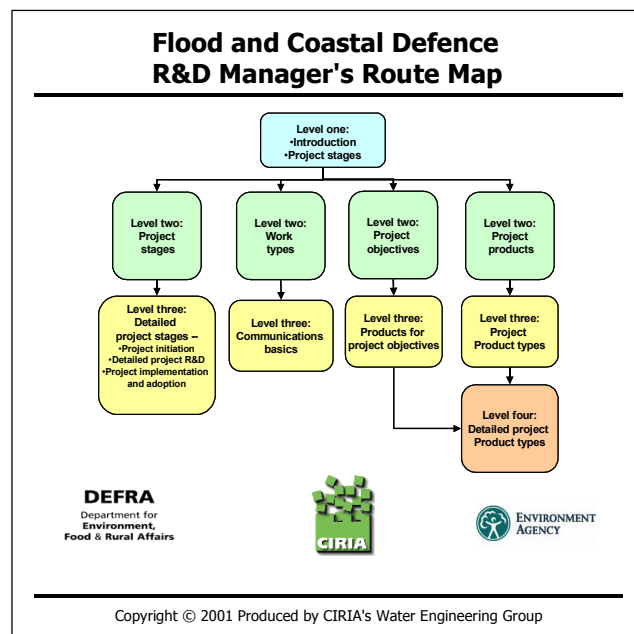


Figure 4.1 - R&D Manager's Route Map - overview page

The Route Map needs to be adopted by R&D managers to plan for effective uptake. The most efficient way to introduce R&D staff to the Route map and the related outcome-based approach is through a series of short (approximately 2 hour) workshops. Following these workshops, the attendees should promote the outcome-based approach using the Route

Map. To ensure the rapid, general, application of the tool when an appropriate level of generic support is available, it should be rolled out to all those who may need to use it directly or need to consider how R&D uptake should be approached to be effective. This will have a significant impact on the approach taken to projects and thus on their success in achieving outcomes rather than just outputs.

The Route Map builds upon approaches to uptake adopted in successful R&D projects and is designed to provide:

- Guidance on the consideration of the uptake process at the initial planning phase to facilitate project design and budgeting;
- Advice on relevant project outputs at different stages of a project;
- A focus on the stakeholders involved in different types of R&D and what is appropriate to meet their needs;
- Advice on integrating communications strategies with other project processes;
- Guidance on dissemination and implementation strategies that lead to adoption;
- A computer based system to assist project managers to explore and consider different options/issues relevant to individual projects and identify appropriate actions; and
- A support tool that is readily updateable/extendable in the future.

The Route Map must be supported at a wider level to make sure the responsibilities for R&D uptake are clear and that some specialist tasks - related to uptake - are carried out in a more efficient manner. Existing R&D procedures and processes need to further highlight R&D uptake issues from the outset through the project and planning approval process and at review stages of projects. These include, for example, the DEFRA CSG7 form, and the Environment Agency Form A and ESRE process. This is not to change existing processes and procedures but to highlight the importance of using the Route Map to answer questions and plan sound strategies for dissemination and/or implementation and adoption from the outset of the work. The full range of relevant processes and procedures are in the DEFRA R&D Handbook and the Environment Agency R&D management processes and procedures (and the Project Management System).

4.4.2 Resources for Route Map

Initial training on the Route Map should be undertaken by CIRIA (Tool Designer) and given to R&D support staff in DEFRA and the Environment Agency as well as Theme Leaders. Environment Agency/DEFRA R&D support staff would then provide training to other staff as required. Assuming regionally based sessions, and also the use of Operating Authority or DEFRA meeting rooms, audio-visual aids, and subsistence, this initial training will cost £6.5k. There will also be a cost to organisations in staff time to attend training/awareness sessions. It is envisaged the training session will be no longer than 2 hours and allow follow on meetings for FCD staff in Operating Authorities. On-going support for (and development of) the tool will be part of the new uptake support post's role (see Section 4.1.2).

4.5 Techniques and skills for managing and producing outputs

Recommendation: The techniques and skills used in managing and producing FCD R&D outputs should be enhanced to ensure consistent and effective uptake.

Benefit: FCD R&D outputs are easier for users to obtain or adopt and are produced more efficiently. These recommendations provide the foundations required to achieve accessible information from R&D projects. In particular it will help to ensure that the messages from and for research findings are appropriate and will help to develop a knowledge-sharing culture.

Resources: the main resource used to achieve this recommendation is the new uptake support post identified in Section 4.1.

In addition to the provision of more resources for R&D management and dissemination purposes, it is also necessary to address getting systems running more effectively and consistently to make better use of these resources. The following actions will help to achieve this.

4.5.1 Towards more usable R&D outputs (immediate action)

This action involves supporting the production of consistently well-written and designed project outputs, which is further assisted by building a brand for a common look and feel to Joint DEFRA/Environment Agency outputs (see Section 4.10).

Role of new uptake post-holder in achieving more user-friendly outputs:

To assist in achieving user-friendly written outputs a specialist uptake-orientated support is needed within the Joint Programme. This support (envisaged as the new position discussed in Section 4.1.2) will help R&D managers with the specification and scoping of project outputs, help project teams with implementation plans, and advise on the production process. This service will not duplicate existing report production services (such as PENS in the Environment Agency) but supplement them, to provide assistance and guidance, during the project life with an emphasis on achieving uptake. This assistance will be both to the Project Manager in identifying forms of outputs and researcher selection, and to the researcher themselves (this may include sourcing editorial support) to ensure appropriate standards are achieved.

The uptake support post will also provide a link across the whole of DEFRA and the Environment Agency, having input into all projects to ensure appropriate outputs (note this will be input but will not necessarily review ALL outputs). It will also be the responsibility of the post to draw together good practice in advising on production of the different output types from both DEFRA and the Environment Agency and develop joint best practice.

There is a need to produce consistently well written (using plain English) and well designed outputs targeted to the end users of the information on all projects. Researchers have a personal, and sometimes corporate, style in presentation of R&D outputs. Some outputs are very suitable for end users and others fail to communicate effectively to target audiences. This may be because either the target audience has been misidentified, or that the report has not been written using the appropriate words or format. The input of writing expertise benefits printed outputs in particular, and improved writing and design of the information

makes it easier to use. (Note: projects with outputs such as CD ROM or Video tend to use specialist input as a matter of course).

Research Contractors need to cover a significant range of types of outputs. It is important to ensure that each has the right capabilities on its team. They will invariably be able to produce technical information but may require guidance on clear communication of project findings. Many researchers will have the skills, whilst others may require separate resources to be identified, to support the researcher in their delivery. R&D contracts should have two components: scientific/technical/engineering aspects and communications aspects. It is clear from this study that the latter needs more resources to support it from the Environment Agency/DEFRA R&D management services since the same deficiencies in communication are continually occurring.

4.5.2 Develop measuring and monitoring of R&D uptake (medium term action)

There is a widely held view in FCD circles that R&D uptake is poor but there is no system in place for measurement and monitoring. Although (for example) numbers of reports issued may provide a measure of dissemination, measurement of effectiveness of uptake should be based on outcomes rather than outputs. This will require further development to define how outcomes may be measured and the techniques that are applicable to less tangible measures. There are examples of such information gathering in the marketing industry.

Monitoring implementation and adoption performance:

To support the monitoring of performance, DEFRA and the Environment Agency should give appropriate monitoring responsibilities to Theme Leaders and TAGs. The new post holder should liaise with the Theme Leaders to evaluate overall performance and identify relevant lessons for future implementation and adoption. This links with the new concept of champions for topics or projects within themes – a concept that is emerging from the TAGs and the development of the Theme programmes work plans. The different business groups (e.g. Technical Development Group, NCPM, Theme Leaders, LGA Technical Advisors Group, and others) should also be involved (as appropriate) in assessing successes and failures in R&D uptake (both on the technical issues uptake issues) to improve performance in subsequent R&D work. Different types of monitoring are appropriate for different types of product. Simple informed comment can often be better than bureaucratic counting or surveys. The results of the measuring and monitoring should be reported annually.

Theme Leaders could also instigate and facilitate debate (using email forum or through specific events or activities) to encourage feedback and assess the success of uptake. When seminars or workshops are included in the implementation plan there is a good opportunity for the collection of feedback on R&D outputs and recommendations for additions and modifications.

The new support post must be involved in this process. Through contact with Theme Leaders, Topic Leaders and Centres of Expertise, the post holder can analyse and evaluate the results of the monitoring and can determine best practice in uptake methods, which can then be promoted throughout FCD R&D. The post holder should also have contact with Theme Advisory Groups as these not only represent users but also act as pathways to other end users.

4.5.3 Research on communication

To further develop effective communication of R&D, DEFRA and the Environment Agency should consider putting further resources to looking into other areas, such as:

- Knowledge sharing;
- Information communication;
- Learning organisations;
- The role of public relations in R&D;
- Business efficiency for R&D implementation and adoption; and
- Monitoring effectiveness of techniques.

However, we would recommend that this is progressed alongside the development by DEFRA and the Agency of their wider approaches to knowledge management as both organisations are currently developing or implementing new corporate approaches. It may also be appropriate to pass a watching remit for this work to the Policy Development TAG.

4.5.4 Resources for techniques and skills for managing and improving outputs

The new uptake post holder will provide support to R&D projects on specifying matters related to uptake. This will include liaison with PENS, the R&D function, and the Science group in the Environment Agency and CSG in DEFRA. This will also include use of the new contract to be let for dissemination of outputs from all Environment Agency R&D Programmes. The contract will deal with both electronic and paper publication and it is recommended that it be extended to service the Joint R&D Programme. The post holder will act as a focus for best practice in the planning and production of outputs. He/she will ensure lessons are passed on to future projects. The post holder will also need to develop techniques for monitoring performance. It is envisaged that monitoring of dissemination will be developed first over the next year with monitoring of implementation and adoption being assessed after that (to allow the changes in the management of the programme to settle down). Further research into effective and consistent communication systems should be considered taking into account DEFRA and Agency policy.

4.6 Using Information and Communications Technology to get the process running smoothly

Recommendation: Information and Communications Technology should be used more effectively to assist uptake processes.

Benefit: More efficient and effective dissemination of R&D information to those involved in FCD R&D (users, managers, researchers, advisors). This provides more accessible information, using new technologies, helps to champion research and research findings, facilitates the development of a knowledge sharing culture and helps to promote individual learning and personal development.

Resources: Major upgrading and testing of a web site £50k over 6-9 months. On-going updates should be allowed for in every R&D project (e.g. through the provision of summary information). The new post holder (Section 4.1) should undertake the coordination of email groups, with input from R&D co-ordinators, Theme Leaders (and Project Managers).

4.6.1 Effective use of Information and Communications Technology (immediate action)

Information and Communications Technology (ICT) has a key role to play in the future of improving the uptake of R&D. Internet technology now makes it possible to access information relevant to specific user needs almost instantly. A website can also provide information to help R&D managers and researchers identify other relevant work and design implementation strategies for different user groups. In the long term, the use of online forums to encourage exchange of experiences between users provides the opportunity for personal communication in a convenient way.

It is clear that publishing of R&D outputs is moving from traditional paper-based outputs to electronic publishing, although there is likely to be a long (up to 20 years) transition period for this process. It is therefore important that paper publication remains an alternative form of R&D output for the immediate future. Electronic publications can be delivered through the Internet or local Intranet. It is important that consideration to the publishing format should be given to current and future R&D projects in order to ensure that outputs are readily available for electronic uptake. The new Environment Agency contract for dissemination of outputs from all of its R&D Programmes – due to be awarded in April 2002 – will provide for all this. As stated in Section 4.5, we recommend this should include the whole Joint R&D Programme. It would be cumbersome if this service was not provided by a single provider.

We recommend that an improved website is developed for the Joint R&D Programme. The website will need to be accessible, adopted, and used by Flood and Coastal Defence community. To this end, it is important that the expectations of the site are well managed and that information on its purpose, content and capabilities is widely disseminated before, and as, the site goes live.

Website description:

An over-arching website is required by all those involved in FCD to provide R&D listings, publicity and summaries and also training and publishing information. However, it should be recognised that information on the website is primarily for dissemination and will not achieve implementation and adoption of R&D on its own. The recommendations on structure, style and management for a joint DEFRA/Environment Agency website (see Appendix 3) aim to establish a useful and usable information source and must reflect the taxonomy (e.g., key words) and practice of FCD. It must also link in with the developing Knowledge Management strategies of the Environment Agency and DEFRA and link best practice to research. The site must be resourced so that it can be reviewed and developed, with feedback from users in the FCD community, as skills and experience in using the web and this site develop. The website should preferably form a publicly accessible part of the restricted management website used by Project Managers and Theme Leaders, who will be able to view the whole site. It is important that despite this division the site remains seamless for individual users. The proposed publicly accessible site is outlined in Figure 4.2 and 4.3.

Whilst the site will be technically managed by DEFRA and/or Environment Agency staff, the content of the web site will be overseen and developed by the new post holder. They will also be responsible for ensuring that project summaries are received from the Project Manager for posting on the website. Further early discussions should be held with DEFRA and Agency IT staff to agree which organisation takes overall charge for the site. To the

user, this will not matter, neither should it constrain its links to the Agency's R&D Dissemination Centre. (See Figure 4.2 and 4.3)

Email is commonplace and it is therefore logical to build email Groups for particular topics or subject areas and to use these Groups for communicating information on new R&D outputs or eliciting input to R&D projects. These need to be established by the Theme Leaders and on individual projects by the Project Manager. It is envisaged that, in the short term, R&D projects would establish their own websites if R&D managers wish to use these for interactive discussion. The new support post should hold these lists and ensure, through monitoring, they are properly utilised and not misused (or over-used).

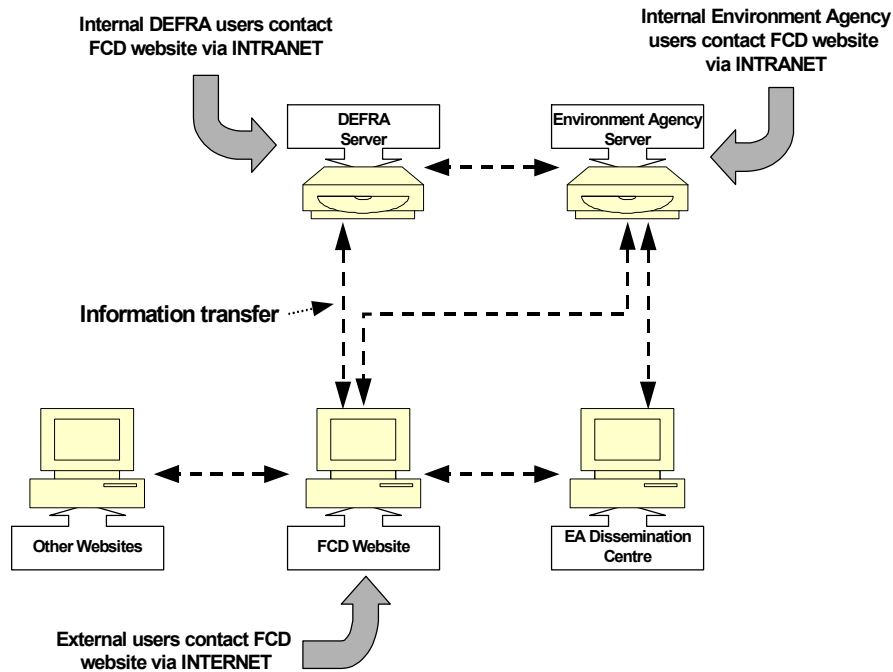


Figure 4.2 Diagram showing FCD website located under DEFRA server

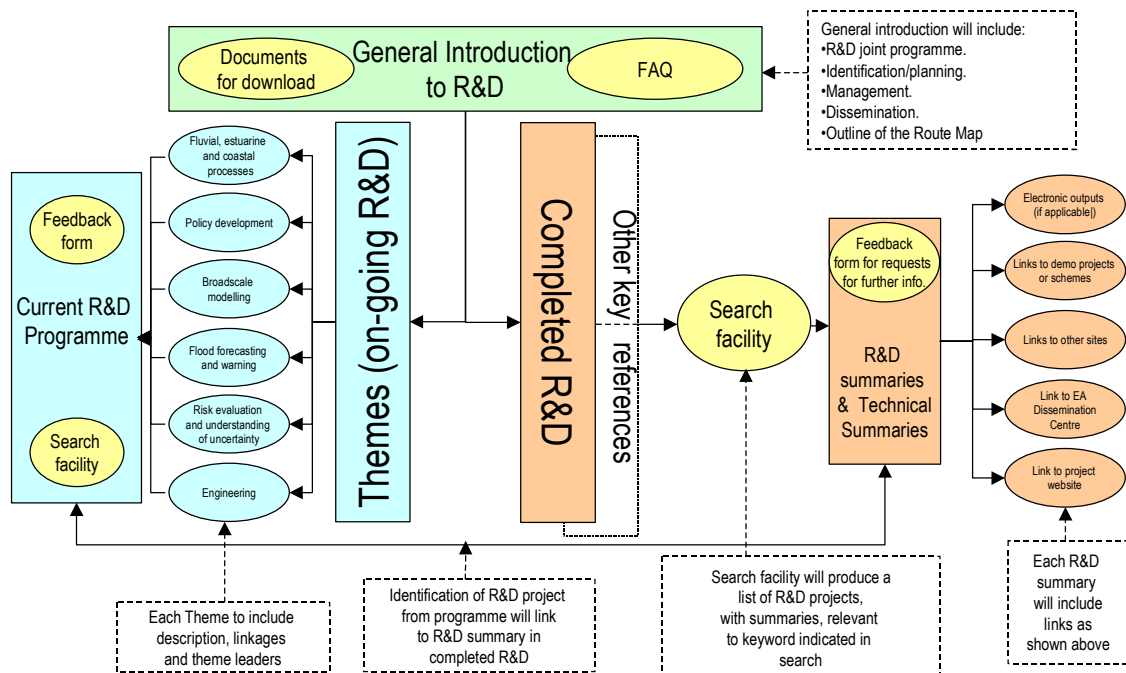


Figure 4.3 Conceptual framework for FCD R&D public access website

4.6.2 Resources for innovative methods

The web site will be technically managed on existing DEFRA or Environment Agency platforms although some additional space may be required. A contract should be let to design and create the web site. This will allow for easy population with new R&D Technical summaries of outputs and key projects (by R&D staff), links to project sites where they exist, and a link to allow outputs to be ordered on-line (note, this simply utilises the Environment Agency R&D Dissemination Centre with electronic linkage). It is estimated the design and creation of the site will cost £50k and take 6-9 months including population with recent outputs, creating identified links, and testing. The on-going population of the web site should be allowed for in every R&D project. Each project should provide a summary in the appropriate format for direct addition to the site and the main outputs in appropriate electronic format. The new post holder should undertake the co-ordination of email groups, with input from the Theme Leaders (and Project Managers).

4.7 Making best use of software and tools in R&D outputs

Recommendation: Develop improved links between software, models and tools and FCD R&D.

Benefit: Increased efficiency in the use of software, models and tools within DEFRA, Operating Authorities and the Joint R&D Programme. This will foster better use of research results and efficiency in the use of software and models. It will also ensure that software and R&D achieve better standards and are based on approaches that link in with existing expertise held by FCD practitioners – thus helping end-users to have confidence in research findings and understanding how they can be used operationally.

Resources: Provided through projects, these will be variable depending on the policy and approach identified by Theme Leaders, but particularly relevant to Broad-scale modelling, Engineering, Flood Forecasting & Warning, and Risk & Uncertainty Themes.

4.7.1 Software, tools and R&D (medium to long term action)

A significant part of the delivery of R&D is now best done through computer software. Physical tools and equipment are also developed through the R&D programme, such as measurement devices. DEFRA and the Environment Agency should develop a software and commercial products strategy whereby any software or tool development is progressed in stages. This will enable, in theory, basic R&D to be done in an open manner with commercial development following an agreed breakpoint. (This means that other models do not get developed directly but depend on commercial development to make use of the basic R&D results which are released to the public domain). Clearly the commercial implications of any decision will need to be assessed.

4.7.2 Resources for software, tools and R&D

FCD need to discuss this issue to identify a clear policy and approach to software and tools. There may be parts of R&D projects relevant to particular software and/or tools that need to be identified and the tool developers brought into the project to ensure appropriate

compatibility, formats, and details of output are achieved. This will assist greatly in a sector where computer modelling is commonplace and tools are under continuous development. There also needs to be agreement on nationally-used software and tools by DEFRA and the Operating Authorities to ensure best development of these models rather than proliferation of multiple approaches. The Technical Group of the Framework Consultants should be consulted on the relevant software and tools.

4.8 Build upon pilot or demonstration project approach

Recommendation: Demonstration projects should be used more effectively to enhance and pilot R&D.

Benefit: The outputs from R&D projects will have been properly tested prior to general use and innovations or lessons-learned will be fed back to improve the R&D. This helps to ensure that the output of the R&D is checked by and/or finalised through prototype use. FCD practitioners will thus have an understanding of what the research output can achieve and a confidence in its operational application. This also facilitates professional development (provision of case studies) and encourages innovation.

Resources: Consider awarding a project to provide guidance on the use of pilot and demonstration projects (cost £15k).

4.8.1 Pilot or demonstration approach (immediate action)

Pilot or demonstration projects should be used in two ways:

- Encouragement of the use of pilot and demonstration projects to finalise (test) and introduce the results of R&D projects; and
- Encouragement of innovations learnt or tested on FCD operational or capital projects and schemes to be disseminated to Operating Authorities and the FCD industry generally using the FCD R&D process as a conduit.

It should be noted, with regard to the second use, that such schemes might identify new and better methods. Such results can be disseminated through the R&D system, provided they are accepted by a Theme Leader. There is a need for a study to identify the best practice in demonstration/pilot projects of either type and for this information to be adopted as FCD practice.

Typically the pilot project would be undertaken as part of the FCD scheme. Additional costs could either be accepted as a part of the improvement process or some generic elements could logically be regarded as R&D, such as:

- Monitoring of site performance;
- Analysis of data;
- Producing generically applicable information from the results; and
- Communication of information.

The approach adopted would probably depend on the relative costs. In all events a shared approach to learning and innovation would be adopted.

In a pilot project, it should be made clear to everyone whether the scheme has a special research status, for example, in testing an approach, as a necessary part of learning and improving FCD practice. The Tollesbury Managed Retreat Project would be an example of this. Pilot projects are also used to gather experience of the application of R&D results, which can then be fed back to either a revision of the relevant output or to further R&D. It should be noted that Pilot projects can be office based and the opportunity therefore exists for projects to be run fairly inexpensively

4.8.2 Resources for pilot or demonstration approach

A contract to create guidance on demonstration sites should be let, estimated at £15k. The findings of this could then be incorporated into the Route Map, encouraged by DEFRA Regional Engineers and disseminated to all Operating Authorities and the FCD industry.

Guidance for demonstration/pilot projects:

There is a need to develop comprehensive guidance on the overall requirements and approach to demonstration/pilot projects, simply because there are so many different formats of pilot/demonstration projects that can be applied. Where appropriate, this would include a champion for the scheme, any relevant national centre of expertise, and ensure that findings meet local needs across England and Wales.

4.9 Provide environment and incentives for a learning culture

Recommendation: Incentives should be provided to encourage practitioners to be up to date with current practice and to develop a learning culture across Flood and Coastal Defence.

Benefit: The development of learning and continuous improvement as part of the FCD User Culture will encourage engagement with the R&D process and enhance uptake. This develops more compulsion, sets performance targets, and in particular develops a “thirst” for R&D thus greatly assisting implementation and adoption of R&D outputs. It is a key factor in promoting individual learning, continuous improvement and fostering a knowledge sharing culture across FCD.

Resources: To be identified by Theme Leaders and programme managers within the next year. Within the Environment Agency, this should be carried out as part of the Human Resources "Change Project". The new post holder could provide part of the resources required as a link point for this form of training etc. Training budgets of DEFRA and Operating Authorities should also provide part of the required resources.

4.9.1 Incentives for individuals (medium to long term action)

Training should be encouraged through creating incentives for individuals to be up to date with current practice (see also discussion on Training under Section 2.3.6).

Influencing individuals to implement and adopt R&D results:

There are a number of areas where individual incentives to implement and adopt R&D results can be influenced:

- Individual incentives are already addressed by the Environment Agency through the new Flood Defence competencies required for various roles, and the system of personal appraisal and PRP. However, training needs are not always followed through which may be as a result of an individual not being encouraged to attend courses. More incentive for continuous learning is required. This problem is reflected in DEFRA's current review of its internal appraisal system, which could consider a similar approach for Policy based R&D.
- Contribution of positive peer pressure and cultural issues for individual to always be up to date.
- Value statements providing leadership from the top.
- For more detailed and specialist skills competencies, specific FCD courses and standards need to be promoted. CPD requirements of CIWEM and ICE are mainly too general for the specific requirements of the FCD community and need to be placed in context (current action by EA training). It is important to commence communication with ICE and CIWEM for CPD and the relationship of this to the R&D programme.
- For consultants and contractors, Operating Authorities should specify the use of the relevant design and planning tools, which include R&D outputs, in the tender documents or work briefs for FCD contracts. Theme leaders should ensure that any such requirements for use are made known through the Implementation Plan of the R&D outputs concerned. Use of the outputs could then be endorsed by:
 - The Environment Agency National Capital Programme Management team.
 - The Local Government Association Technical Advisors Group.
 - The Technical Development Group of Framework Consultants.
 - Other relevant business groups, e.g. Flood Risk Mapping.
- A further way of creating incentives to use R&D outputs is to build on the user communities that are being developed within the Themes of the Joint R&D Programme. For example, one of the reasons that the Flood Estimation Handbook has been well received is that there was an existing user community for the Flood Studies Report. One way of developing such groups is to create email Groups to enable quick updates on R&D findings or outputs (see Section 3.4.1).

4.9.2 Resources for incentives for individuals

This should be discussed by Theme Leaders and programme managers within the next year and contact points identified to discuss training based on the R&D programme with the professional institutions. The new uptake post holder could become a link point for this form of training (as well as co-ordinating email Groups). Training budgets of DEFRA and Operating Authorities should be used more fully to adopt the findings of R&D.

4.10 Develop an improved image for DEFRA and Environment Agency R&D

Recommendation: Develop an improved image for DEFRA/Environment Agency FCD R&D and the benefits that it provides.

Benefit: This will raise the profile of R&D within the FCD community, provide engagement with the R&D process and make the end users more willing to implement and adopt R&D outputs. This recommendation helps to enhance the accessibility of R&D by championing the FCD R&D “brand” to all FCD users, including the public.

Resources: This will be driven by the FCD R&D Programme Co-ordinators in DEFRA and the Environment Agency and implemented by the new uptake post holder (Section 4.1) in liaison with existing DEFRA/Environment Agency staff (e.g. PR). This should utilise communication theory based approaches as identified in Appendix 6.

4.10.1 Marketing (medium term action)

The Joint R&D Programme needs to market itself better to FCD users. DEFRA and the Environment Agency/R&D management should work with their own public relations and user staff to produce a marketing plan. The plan should identify initiatives and opportunities outside R&D to promote its work. This will aim to raise the profile of R&D and improve attitudes towards it. Such initiatives should include better publicity in the popular Civil Engineering press, for example New Civil Engineer. It is important that R&D is publicised as widely as possible early on in a project, and through more targeted channels as the findings begin to emerge, in order to match work with the requirements of people DEFRA and the Environment Agency are working with.

4.10.2 Branding of R&D outputs (immediate action)

Joint R&D programme branding:

The brand for the Joint R&D Programme should be developed to help with recognition of R&D’s input to the business. The use of the brand will help those working in FCD to appreciate the contribution that R&D makes to everyday business. Branding for output types should build on the corporate requirements for R&D reporting and link to the specific requirements of different user groups. The general look and structure of different types of R&D outputs could be branded with different styles. This would help in recognition of the type of output and use of it; for example, certain sorts of information appearing in the same parts of written reports. By increasing the ease of use of R&D outputs, uptake of R&D results should be improved.

As discussed in Section 4.10.1, branding of different types of output will help build the image of R&D outputs and in turn assist in getting systems running more effectively and consistently. The current DEFRA approach still uses the brand of each of the research contractor organisations, resulting in FCD R&D outputs not being instantly recognisable. What is required is a common series of document styles and types for R&D dissemination. The development of a common brand has been initiated and, for example, a cover design has been produced for joint DEFRA/Environment Agency reports. This will help to create

an identity for R&D undertaken by disparate organisations for DEFRA and the Environment Agency that is linked to the end users' needs. Branding would be two fold:

- Brand for R&D programme; and
- Brand for output types (within overall R&D programme brand).

4.10.3 Resources for improving R&D image

Creating a brand for DEFRA and the Environment Agency joint outputs is relatively straight forward. This can be developed by Environment Agency and DEFRA staff (programme managers, R&D staff, PR departments) and reviewed through DEFRA and the Environment Agency, the TAGs and other contacts (as contributions in kind). Detailed specifications for the format and brand of outputs are being drawn up as part of the on-going process; the new post holder could manage this and act with FCD R&D support staff.

Leaflets and promotional material should be encouraged from individual projects and funded through them. The new post holder and Theme Leaders will advise and give direction on this. Further branding and promotion of R&D should be developed in the long term.

Detailed actions should be considered and discussed over the next year by the Theme Leaders and programme managers.

4.11 Make better use of centres of expertise

Recommendation: Use National Centres and other centres of expertise to provide advice and support services in applying R&D knowledge.

Benefit: To make uptake of R&D outputs more effective by providing clearly identified technical support from recognised centres of expertise. This provides champions for both research and the application of research findings. It also helps to develop standards for application.

Resources: To be identified following the development of the Environment Agency Science Plan.

4.11.1 National Centres and centres of expertise (medium to long term action)

What is a National Centre or a centre of expertise?

National Centres are established groups within the Environment Agency to provide focal points of expertise and knowledge on technical areas of key importance to the Agency's business. This supporting expertise is now available at both the policy and operational levels (the actual structure of these groups within the Agency is currently under review). Centres of expertise are similar technical focal points established in organisations external to DEFRA or the Environment Agency.

Environment Agency National Centres, and other external centres of expertise, can be progressively utilised for the application of knowledge. They should be resourced (through project and/or function's business budgets) to provide advice and support on specific issues.

These centres are able to communicate information to regional, area, and local audiences. They should act as conduits of R&D knowledge and practical issues within their areas of expertise.

The Environment Agency is currently developing its Science Plan and, hence, the exact position of National Centres is also under review. This recommendation should be discussed with internal Agency Managers as the Environment Agency Science Plan is finalised.

4.11.2 Resources for National Centres

There are no specific additional resources identified but a review of the National Centres and their use in R&D will be required.

4.12 Summary of recommendations

Table 4.1 Summary of recommendations and time-scales

Recommended Action	Time-scale
1: Provide specific support for uptake (dissemination, implementation and adoption) of FCD R&D.	Immediate.
2: Agree an Implementation Plan for the delivery of each R&D output.	Immediate.
3: Prepare, involve early, and train users for delivery and use of R&D outputs.	Start immediately, build up over longer term.
4: Provide R&D Project managers with easy to use guide to R&D uptake – a “Route Map”.	Immediate.
5: Enhance techniques and skills used in managing and producing FCD R&D outputs.	Start immediately, build up over longer term.
6: Use new information and communications technology (ICT) to assist the uptake processes.	Start immediately, build up over longer term.
7: Develop improved links between software, models and tools and FCD R&D.	Start immediately, build up over longer term.
8: Use demonstration and pilot projects to enhance the R&D uptake process.	Immediate.
9: Provide environment and incentives to encourage mainstream staff to keep up to date with current practice.	Start immediately, build up over longer term.
10: Develop an improved image for DEFRA and Environment Agency R&D.	Immediate to medium term.
11: Nurture centres of expertise to provide advice and support services in applying R&D knowledge.	Start immediately, build up over longer term.

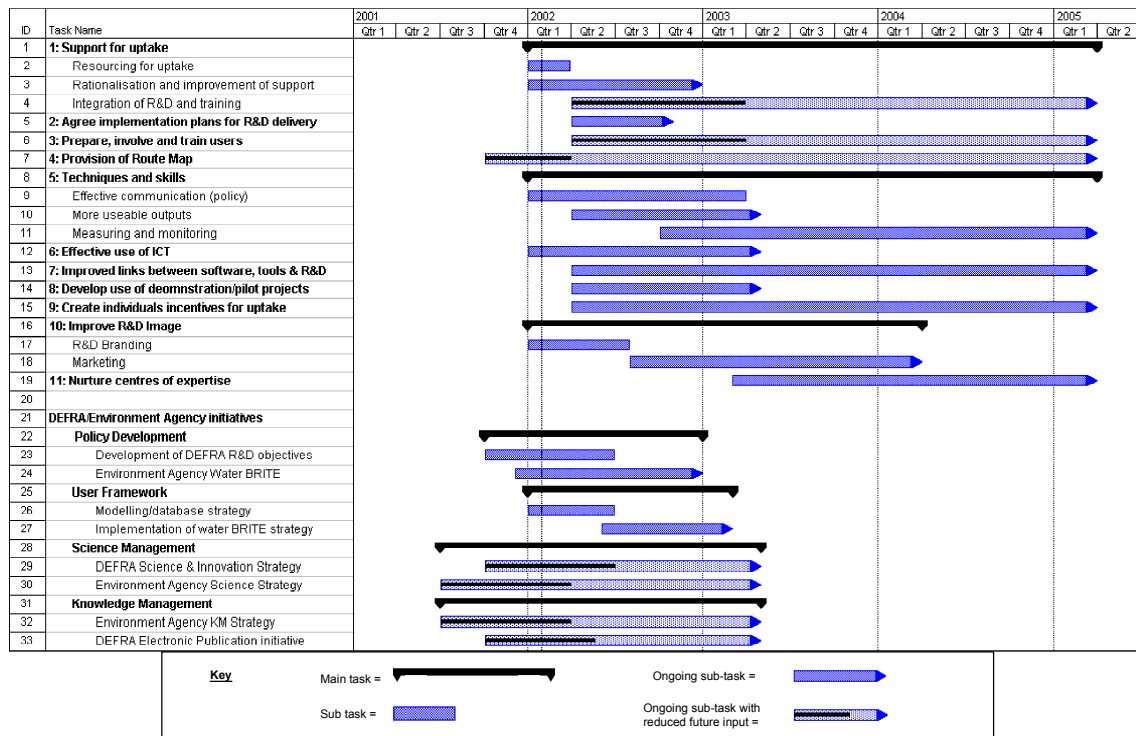


Figure 4.4 Outline programme for implementation of recommendations

Table 4.2 Recommended Actions and those benefiting from them

Recommended Action	Affected
1: Provide specific support for uptake (dissemination, implementation and adoption) of FCD R&D.	R&D Project Managers and FCD Practitioners (and Users).
2: Agree an Implementation Plan for the delivery of each R&D output.	R&D Project Manager and Users.
3: Prepare, involve early, and train users for delivery and use of R&D outputs.	R&D Users.
4: Provide R&D Project managers with easy to use guide to R&D uptake a "Route Map".	R&D Project Managers.
5: Enhance techniques and skills used in managing and producing FCD R&D outputs.	R&D Project Managers, Environment Agency R&D Publications team, FCD practitioners.
6: Use new information and communications technology (ICT) to assist the uptake processes.	All FCD stakeholders.
7: Develop improved links between software, models and tools and FCD R&D.	R&D project teams, FCD practitioners, Term Consultants, Researchers.
8: Use demonstration and pilot projects to enhance the R&D uptake process.	R&D Project Managers, R&D project teams, FCD practitioners.
9: Provide environment and incentives to encourage mainstream staff to keep up to date with current practice.	DEFRA/Environment Agency training programme managers, FCD Practitioners.
10: Develop an improved image for DEFRA and Environment Agency R&D.	All DEFRA/Environment Agency R&D staff, all FCD stakeholders.
11: Nurture centres of expertise to provide advice and support services in applying R&D knowledge.	National Centres, Theme Leaders, FCD Practitioners.

Table 4.3 Recommended actions and owners

Recommended Action	Owner
1: Provide specific support for uptake (dissemination, implementation and adoption) of FCD R&D.	Driven by the FCD R&D Programme co-ordinators to ensure that the new uptake post is achieved. Support is needed from their Science Departments.
2: Agree an Implementation Plan for the delivery of each R&D output.	FCD R&D Programme Co-ordinators and Business Users.
3: Prepare, involve early, and train users for delivery and use of R&D outputs.	Theme Leaders, Business Users and Training.
4: Provide R&D Project managers with easy to use guide to R&D uptake a "Route Map".	Initially provided as part of this study, then owned by the FCD R&D Programme Co-ordinator with technical support from the new uptake post holder and ICT staff.
5: Enhance techniques and skills used in managing and producing FCD R&D outputs.	Led by the new uptake post-holder and championed by Theme Leaders, TAGs, Topic Leaders, with support from Environment Agency/DEFRA R&D Service Departments. This will also link in with the new Knowledge Management strategies.
6: Use new information and communications technology (ICT) to assist the uptake processes.	Theme Leaders, R&D Project Mangers with support from DEFRA/Environment Agency internet staff and new uptake post holder.
7: Develop improved links between software, models and tools and FCD R&D.	Theme Leaders, Operating Authorities, Technical Advisory Group of the Framework Consultants, Centres of Expertise.
8: Use demonstration and pilot projects to enhance the R&D uptake process.	An external contract would be let, managed by the new uptake post-holder.
9: Provide environment and incentives to encourage mainstream staff to keep up to date with current practice.	led by FCD R&D Programme Managers with support from Theme Leaders and the new post-holder. This will also need to link with DEFRA/Environment Agency Training and other initiatives designed to encourage CPD.
10: Develop an improved image for DEFRA and Environment Agency R&D.	led by FCD R&D Programme Managers with support from DEFRA/Environment Agency PR Departments links to the Environment Agency's new Communications and Knowledge Management strategies and DEFRA's corporate identity. Theme Leaders, new uptake post-holder, TAGs FCD R&D support staff will also champion and support this action.
11: Nurture centres of expertise to provide advice and support services in applying R&D knowledge.	Championed by National Centres/centres of excellence and FCD R&D Programme Managers with specific actions by Theme Leaders as identified following the development of the Environment Agency/DEFRA Science Plan.

4.13 Summary of resources

The total resources for implementing the recommendations as outlined above can be summarised as:

- One-off expenditure of £60k to improve effectiveness of uptake;
- About £30k of additional on-going annual expenditure for a new staff member to provide generic support to the Joint R&D Programme on uptake and to drive forward the improvements;
- Other funding must be allocated through each specific project to provide relatively more resources for uptake of the R&D products;
- An increase in the use of existing training and CPD resources by the user to support the adoption on new outputs from the Joint R&D Programme; and
- Contributions in kind from users and researchers in playing their part in the uptake process, particularly in continuous improvement and learning, and in planning better outputs.

4.14 Conclusions

- A wide range of historical issues that can constrain the uptake of R&D products have been identified (Appendix 2). The recommendations provide a framework for improved planning of R&D products and their uptake, rather than addressing each constraint in detail. Some constraints are symptoms of past cultures and practices, rather than future issues. The list of past constraints should be checked annually by the R&D Programme Officers to see if the issues are still endemic.
- In relative terms, more funds must be spent on uptake of the results of R&D projects, rather than on the research itself. In particular an implementation plan must be produced for each project. Where necessary, the use of new R&D outputs should be prescriptive.
- During this project, stakeholders have become more aware of uptake issues. Results have been made known to FCD staff and other key groups. Ideas and improvements in good R&D practice have been disseminated through individual consultations, the workshop, and presentations to Theme Leaders. We believe the study has, therefore, already had an impact on improved practice.
- The Route Map for Project Managers will help to improve the planning of uptake for each R&D project. It provides not only a tool to assist in the selection of output products and activities, but also provides a means by which stakeholders can learn about the problems associated with R&D uptake. This should help to bring about a culture change where needed.
- The Website will form a cornerstone of disseminating R&D information to FCD users in the future and ease their task of identifying and accessing R&D results. It should soon become a part of the R&D system.
- A new post specifically to support uptake of the Joint R&D Programme will provide generic support where needed, will assist delivery of the recommendations, and will give a clear focus for future improvements in the uptake of FCD R&D. (contd.)

- Effective R&D uptake requires a collective effort from all stakeholders. Theme Leaders and Project Managers have a particularly important role to ensure that these recommendations are taken forward with each R&D project. While some recommendations are focused at DEFRA and the Agency, we are confident that this report will assist all Operating Authorities.
- The adoption of new R&D products must be seen as a part of a continuous learning process and a continuous improvement culture. Therefore better links with training and CPD are needed. It is unreasonable to expect all improvements to be driven through the Joint R&D Programme, and it is important to view the recommendations in the overall context of improvement and change within stakeholders' organisations.

APPENDIX 1 EXTRACT FROM THE REPORT OF THE ADVISORY COMMITTEE ON FLOOD AND COASTAL DEFENCE R&D

The following text has been extracted from the Report of the Advisory Committee on Flood and Coastal Defence (MAFF Report PB 4112, 1999), Chapter 3 - *Enhancing Research Management and Take-Up*. This details the issues identified and the recommendations made for improved Flood and Coastal Defence R&D implementation and adoption:

3.7 Enhancing research take-up

Introduction

We believe that the true value of the Ministry's and Agency's Research and Development is not being realised due to a fragmented approach to the implementation and adoption of research.

There may be many factors involved here, including the belief amongst potential users that the research was not aimed at the real problem, lack of implementation planning at the start of the R&D project and lack of adoption of the final product by users. The Ministry's unwillingness to impose adoption of its R&D may have contributed to this situation. The Agency's performance in relation to its aim to disseminate effectively its R&D results could be improved.

This is where better research management is needed: the effectiveness of the implementation and take-up of research requires better co-operation between the Ministry, the and other research organisations. This will lead to more effective implementation and ownership of the whole research programme.

3.7.2 Adoption of previous research

We have commissioned a survey of the use of past research commissioned by both the Ministry and the Agency, looking at the way that 64 research projects developed and the impact that they had on end-users.

This surveys shows that the quality of the science and policy-related outputs from these research projects was high, and this is gratifying. However, in so far as this can be determined by the kind of telephone investigation that we have undertaken, the survey also shows that the take-up of the research results is patchy. The level of take-up overall is not good. In some areas it is very low.

Why this is the case is not clear, and will not be clear unless more effort is put into tracing the take-up of research in a more systematic way. We strongly recommend that this be done.

However in the meantime we can only surmise (supported by the data from our survey) as to the reasons for this situation. Poor take-up appears to be owing to a mixture of factors, including the following:

- The research remains hidden to those who need it;
- There are extra costs involved in its application;
- Equipment is lacking;
- Data is lacking;

- Lack of staff expertise; and
- Key data or other results are held back by the researchers.

3.7.1 Key principles for improvement

The following principles and mechanisms should be considered for improving the adoption and take-up of research. This amounts to MAFF and the Agency adopting a much more proactive approach: not leaving take-up to chance but seeking to manage that process actively, rather than passively:

- More accessible information: full dissemination of research results (not least through the Web and other technologies);
- Better co-operation: not least between researchers and research users (this could be built into research contracts);
- More compulsion: more cases where the Ministry and the Agency require their staff and agents to use research results (for example to qualify for grant aid); and
- Setting performance targets and standards for research take-up, and involving researchers and practitioners in meeting these standards.

3.7.4 The recommended ways forward

To ensure that results from research have a better chance of being used, better co-operation between MAFF and the Agency must start at the project planning stage (not least in the Concerted Actions discussed above). This process has started with the Agency and MAFF being involved in the preparation of their respective programmes and the joint funding of some projects. The project boards for such projects now include Agency and Ministry staff and this practice should be extended to all major research projects.

The move to more co-ordinated research will assist in the use of resources from both organisations. The concept of full-time Project Managers will help to release resources for membership of the project boards. The person nominated for membership of a project board is also critical in that that person must act as, and be seen as, the ‘champion’ of the research.

This concept of ‘research champion’ can be extended to the co-ordinated research programmes that cover a partnership between the Ministry, the Agency and other funding organisations and research contractors. The function of a widely spread membership of interested stakeholders will assist the promotion and take-up of the research.

Effective ownership of a research product has been hampered in the past by a lack of implementation planning. Funding of such implementation plans can be seen as expensive but it is necessary to realise the stated benefits of the research. Poor implementation also detracts from the true potential of research and will lack credibility in the eyes of the targeted end-user. Joint sponsorship and co-funding will raise the profile of research and ensure a better response from the targeted audience.

Best practice should be established and used as the standard. Improvements can then be explored to raise the current standard.

Adoption of research has been a matter of influence and persuasion in the form of guidance. The Ministry and the Agency should consider making relevant research mandatory for inclusion in the management of Flood and Coastal Defence. There may be an initial cost in the adoption of research but this is a small price to pay for the achievement of more cost-effective sustainable solutions for flood and coastal defence.

APPENDIX 2 CONSTRAINTS IDENTIFIED THROUGH CONSULTATION

Decision makers, R&D managers and researchers may find the following information useful to review in considering future decisions and actions. The body of the report aims to address as many of these issues as practicable. None of these constraints represent a single individual's view; there were many consistent messages received through the consultation process.

1 **Type 1 constraints – R&D systems and culture**

Constraint 1: Outputs vs. outcomes

The focus in many projects is on R&D outputs rather than outcomes. R&D projects are generally managed efficiently by the Project Manager (in terms of time, cost and adherence to specification) but they are not necessarily effective in getting through to the R&D customer (in terms of achieving actual change).

In the Environment Agency, the BIT (Business Improvement Team) process for R&D ends with the project output. Up until now responsibility for implementation and adoption rests with the commissioning function that has to pick up an implementation plan (produced at the end of the project). This encourages the R&D manager and Project Manager to end their work with production of the R&D output. The advent of the Theme Leaders may improve this situation with them creating a real focus on outcomes. This may not show results until projects that are starting now have moved through to completion and there is likely to be a further lag in time for a general move in culture towards achieving outcomes.

In a lot of cases the implementation of R&D is not seen as a high priority unless it is a 'must do' issue. There may also be a barrier in understanding how to approach implementation and adoption on the part of those who will be involved in taking it forward. In some cases this will cross over all the users of R&D. The final output is, thus, not necessarily well targeted to the R&D customer and achieving the outcome desired for different user groups.

Success in the past has largely been a product on the Project Manager's personal experience, skills, time availability, and commitment to the R&D project.

The Environment Agency is aware of this difficulty and is considering extending the BIT process for R&D to include implementation. This will be taken forward through the *implementation* topic in the Science Plan.

A similar situation can exist with DEFRA led projects, where individual R&D project dissemination is often through DEFRA's existing dissemination routes, although PAGNs contain a synthesis of high level recommendations. DEFRA also relies on organisations such as HR Wallingford, POL, and CIRIA to disseminate project results through publication and sale of reports. Unless there is a clear steer from DEFRA, implementation and adoption of the R&D can be left to the research contractor to promote, and the user to decide to adopt and implement.

Generally speaking, considerably more effort is put into the R&D work itself than into its dissemination and implementation. This is reflected in the amount spent on projects relative to dissemination activities.

Constraint 2: User-friendliness of outputs

Many R&D outputs are not considered to be user-friendly. This is a particular problem for Flood and Coastal Defence, which uses many different types of research (such as Policy, Strategy, Operational, or Blue Skies research). Outputs are, thus, often not suitable for the audience actually picking them up and trying to use them.

This is particularly true for people working on direct operations for Flood and Coastal Defence. They have been recipients of reports or tools that are much longer or more complex than they need to be because they contain background information (literature reviews, descriptions of methods used, etc.) that are of little interest to these users. Operations users often want *guidance* and, sometimes, *data* in a succinct form. Researchers rarely have the communications skills to distil their findings into appropriate outputs for this category of research – even with training. Operations staff in the Environment Agency have overcome this problem, in some instances, through using Operational Investigations. These local investigations are managed directly to address Operational needs. The difficulty here is that these outputs may be too specific to local circumstances and the more generic lessons do not get disseminated to Operational staff in other areas or regions.

Users of policy or strategy types of research can also find outputs unfriendly. If the output is technically biased it may not meet their needs. This is often less problematic as these users often have an executive summary to refer to that can provide an overview of the research. The Blue Skies users tend to have a different approach to the outputs in that they are more prepared to search back to get to very detailed information on a project, how it was undertaken, or the data it generated. This different learning approach means that the users tend to overcome the constraint but may have to invest considerable time and effort to tease out the information they require.

There are notable exceptions to this constraint where all the users of an R&D project have been considered and specific material produced for them but it has often been the case that a single output is produced which can not be well targeted for all the R&D customers. The form of the output should be linked to the intended outcome and thus the intended user. The category of research will have an important bearing on this but within the categories the nature of the research will also be important. If the research is providing information then a full explanation may be warranted. If the research is a tool or technique then the user may need to be aware of limitations and caveats to its use. If the research is guidance it may need to be reliable advice that can be practically followed through.

Constraint 3: Internal distribution of R&D outputs

R&D outputs do not always reach the right people. Users can suffer from either too little information (when they are not made aware of new R&D outputs relevant to their work) or from too much information (when they receive outputs they do not consider relevant to their work). Users who receive too much information become less receptive to subsequent R&D outputs, no matter how relevant it may be to their work.

In the Environment Agency, the effectiveness of internal dissemination has depended largely on the Project Manager's ability to identify the appropriate target audience for the distribution list. In DEFRA there is no formal system for producing a distribution list, but FCD and CSG both take distribution decision. Although users should be encouraged to be proactive in seeking out R&D relevant to their work, effective dissemination is an important pre-cursor to implementation and adoption.

Constraint 4: External awareness of R&D outputs

Section 2.3 describes the dissemination and uptake routes currently used by DEFRA and the Environment Agency. The only reported problem with awareness of R&D outputs externally is in Local Authorities, where outputs do not necessarily reach all the target individuals. This is often an internal distribution, and cultural, problem that can exist in any organisation or company.

Constraint 5: Status of R&D outputs for staff

R&D outputs can arrive on people's desks without any statement of their status or approval. People complain of reports 'appearing' without being told what to do with them or who to refer to. Staff need to be clear on what action they are expected to take with an R&D output in applying it to their job.

Constraint 6: Identification of relevant outputs

It is difficult for users to identify all the R&D outputs relevant to their projects. It is unclear how outputs on similar subjects relate to each other or take precedence. Research contractors usually signpost other guidance, but they tend to give more weight to their own publications than to those of others.

Constraint 7: Guidance from DEFRA and the Environment Agency

It is often unclear to all users which R&D outputs DEFRA and the Environment Agency consider the most important.

DEFRA is reluctant to instruct users to use specific guidance because it wants users to apply their own judgement. This successfully avoids a situation where consultants and clients do not carefully consider their use of information but can leave users wondering which R&D outputs are appropriate to their work. This contributes to users' interpretation of PAGNs (see below).

The Environment Agency seems more prepared to identify relevant R&D outputs, and this sends a clearer message to users, but is rarely prescriptive.

Constraint 8: Feedback mechanisms

There is no apparent feedback mechanism for experiences with using guidance produced by R&D projects.

Exceptions include projects such as production of the Flood Estimation Handbook, where extensive testing was built into the project. New methods are unlikely to be 100% effective at first and need modification as people gain experience with them.

The lack of a feedback mechanism gives the impression that R&D is not integrated into flood and coastal defence design, construction, and operation, and contributes to the user view that R&D is not relevant to their work. This reflects the organisational separation between local, regional, and national activities. In the Environment Agency these barriers are being broken down through recognition of national roles and approaches such as NCPM and Framework Agreements but this needs to be built upon to embrace R&D.

Constraint 9: Model development

There is no system for getting R&D results incorporated into the range of models different consultants use to design schemes (unless the project, in itself, is model development in which case any restrictions on use need to be addressed).

Incorporating the continual flow of R&D results can be expensive, and there may be insufficient incentives for producers to update their models on a frequent basis. This is constrained by such model development being (generally) a commercial activity, and DEFRA and the Environment Agency not wishing to favour one model over another.

Constraint 10: Environment Agency R&D programme setting

Many people do not understand how the Environment Agency sets its R&D programme, and the degree of Regional buy-in varies. This is changing with broader consultation in the new programme become established.

The perception is that R&D is a Head Office issue, and its perceived relevance diminishes in Regions and again in Areas and Districts. Environment Agency Area staff feel that local issues are not covered by R&D, so R&D needs are not brought forward from Areas. Such issues might be dealt with as operational investigations (in which case the results tend not to be shared nationally), or they might not be dealt with at all.

Constraint 11: Implementation of outputs through training

Some R&D outputs need to be implemented through training, but there are difficulties in getting people to identify this as an R&D output when it is first released or at subsequent times, or repeat intervals. There have been exceptions to this such as the Environment Agency having nationally recognised training courses in some subjects where R&D is heavily used.

R&D is by definition uncertain, and this has caused problems for the Environment Agency National Training Service in the past when training budgets have been created for projects that have over-run or developed in new directions. It has also created some tension between training and R&D, with the latter seeing the Training Service as inflexible.

There are examples of good implementation through training, not necessarily through the National Training Service. The SUDS work by CIRIA is a good example of implementation, by a determined champion, in a variety of training forms to meet the needs of different user groups (designers, engineers, planners, Environment Agency staff). Other organisations will reach out to other user groups such as training offered by HR Wallingford and CEH Wallingford.

Constraint 12: Incentives

There are few incentives for people to keep up to date with R&D outputs. This is already being addressed by the Environment Agency as part of the HR strategy for Flood Defence, and competencies are about to be launched for all Flood Defence roles. DEFRA is also moving towards Investors in People status. Further incentives are under development so that Environment Agency staff can work towards CIWEM or ICE membership while acquiring the competencies needed for their work.

In the Environment Agency this constraint is also linked to pressures on staff time and resources (see Section 3.3 below) and lack of clarity about R&D use. The Environment

Agency consultants, under the framework agreement, have a requirement to provide trained staff and so will balance resources to ensure this.

In the wider user community decisions are often taken on financial grounds. The cost of training, for consultants, includes lost earnings as well as direct costs. If there is no payback through additional work, training might not take place. This may not affect the ability of a consultant to win work in traditional areas, or may restrict the work they seek to undertake. In either case, research may not be adopted or implemented and the wider benefits of the research may not be realised for all potential users.

Constraint 13: R&D project management

The use of external consultants to manage R&D projects means the Environment Agency may be reducing the value for some Environment Agency staff of being involved in R&D. There is a risk that operating as a client-only reduces personal development opportunities and reduces the motivation of involvement in R&D.

Constraint 14: Perceived bureaucracy

The R&D system is seen as bureaucratic. This gives it a poor image that deters people from attempting to use it. It is clear that systems and controls need to be in place and that removing these barriers does (periodically) take place.

Constraint 15: Local authority representation

Local Authorities do not feel well represented in R&D programme setting and prioritisation. The allowances and staffing levels for involvement in R&D, in Local Authorities, are a serious constraint. This affects the perceived relevance of outputs to this group of users and therefore their uptake of R&D.

2 Type 2 constraints – Organisational and institutional systems and culture

Constraint 1: Time and resources

Operating Authority staff feel they are short of time, so they can not afford to put effort into reading R&D reports (or into managing R&D projects). This time pressure could be real or imagined, but it is a significant constraint.

Low staffing levels means people are under time pressure and unable to think about R&D or following anything but an existing, already accepted approach. There is also a high turnover of staff in some Environment Agency areas, which makes it difficult to achieve any continuity in R&D projects (which typically need a three-year management commitment).

Constraint 2: Flood and Coastal Defence funding

The national system of approving and funding flood and coastal defence projects (through Flood Defence Committees and local councillors) is seen as discouraging innovation and implementation of new ideas. Energy is perceived to be focused on passing through decision gates (satisfying the DEFRA Regional Engineer, meeting PAGN requirements, meeting procurement requirements) rather than on seeking the best scheme through use of the best information and knowledge emanating from R&D. The exception to this is where the procurement process requires that such innovation and use is sought in schemes. In addition, funding is regionally controlled and ring-fenced but can be lost if not used in time. There is a competition driver for funds but based on assets, and putting forward acceptable

schemes within the 'rules' rather than innovation and best practice delivery. This means the market place does not encourage competition based on improvement but rather on lowest cost and speed of delivery to a defined specification.

Constraint 3: Use of PAGNs

DEFRA is not prescriptive about the use of its research results (or any other guidance), but it does include important results in PAGNs. The intention is to place responsibility for design with the Operating Authorities, and their consultants and thus encourage innovation and avoid simplistic design and consulting services. In practice PAGNs can be followed quite rigidly and seen as the level of requirement for a scheme. In some cases the effect is opposite to what is intended and no innovation takes place. Where innovation does occur it is often personally driven by the interest or professionalism of the client or consultant.

Constraint 4: Risk aversion, learning and knowledge management

The approach to Flood and Coastal Defence schemes is risk-averse by client, consultant, and contractor; this does not encourage the use of R&D. This is strongly driven by the culture, basic training, and tradition of engineers. The recent drive for national consistency and the need for national standards are also important factors here. On balance there is a need for national consistency – but it does affect local responsiveness and therefore the way R&D projects are implemented.

Construction and engineering as a sector, which includes the FCD user community, does not have a learning culture. In the FCD community, people tend to be promoted into senior management mainly from technical backgrounds. This tends to give the FCD community a rather narrow outlook on the world. This perpetuates the problem of learning skills, and incentives to share knowledge, being underdeveloped. Knowledge management is poor, and learning tends not to cross project and organisational boundaries.

The Environment Agency Business Improvement Team's work on defining processes may not help to encourage innovation, but it will give clarity to R&D needs.

Constraint 5: Objectives and appraisal systems

Environment Agency staff have clear objectives set on an annual basis. Their personal objectives and development plans are their main drivers, as these determine how they will be appraised and paid. R&D and the need to keep up to date rarely appear in these objectives and plans and they are not adapted to reflect new R&D appearing during the year. The appraisal system may not acknowledge the R&D project management as part of targets or as a means of achieving personal development in project management.

No similar problems have been reported in DEFRA or in other user groups.

Constraint 6: Reduction of informal communication

The government drive to reduce business miles is reducing the amount of informal communication that takes place on a national basis. This makes knowledge sharing (including R&D results) more difficult.

In the longer term this could be balanced by the growth of electronic communication, and more regionally based initiatives, but this balance has yet to be achieved. This is particularly true where I.T. systems require improvement.

Constraint 7: Environment Agency culture

Despite clear intentions to develop a culture of learning and continuous improvement, the Environment Agency retains elements of a command and control culture in which people expect to be told what to do. R&D is often not taken up unless someone tells people to do it, and this very rarely happens.

3 Type 3 constraints – Constraints to individual learning

Constraint 1: Reluctance to change

Many people think they know how to do their jobs and that there is no need to change their existing practices (“I’ve been doing this for thirty years...”) and, consequently, are not open to training or to new ideas from R&D projects.

Constraint 2: Professionals and learning

In common with other professionals, engineers are not very good at real (double-loop or continuous) learning. They need training to be able to readily switch from defending what they know to productively reasoning that there could be way of learning or approaching a problem.

Constraint 3: Poor understanding of scientific and engineering principles

Some people believe that the current education system in the UK does not encourage real understanding of scientific principles as it did in the past. This means that people accept ideas and models as ‘black boxes’ without questioning what is inside, therefore maintaining the status quo rather than innovating and developing new ways of doing things. This reflects the increasing diversity of work people are expected to undertake and a greater reliance on accepted approaches.

Constraint 4: Learning time

A large number of people perceive they do not have time in a busy working and private life for learning for its own sake. The time that is allowed for learning is often taken up on learning material for (say) particular manuals, packages, procedures that are seen as a fundamental requirement for the job. This applies equally to a client as a consultant.

Not allowing this time is a serious constraint to adopting innovation and to the way in which learning takes place.

APPENDIX 3 OUTLINE SPECIFICATION FOR A DEFRA/ENVIRONMENT AGENCY FLOOD AND COASTAL DEFENCE R&D WEBSITE

1. Structure of the site

An existing R&D management website containing general information on Themes and the Joint R&D Programme already exists for a restricted group of R&D managers. Additionally, DEFRA and the Agency are publishing some information and reports electronically through their own websites as an interim measure. It is recommended that the following information is made publicly available through a new DEFRA/Environment Agency Flood & Coastal Defence R&D Website (see Figure A.3.1):

1.1 General R&D Information

To provide an overview of the Joint R&D Programme for those unfamiliar with or uncertain about it. This will also include information on any changes to the overall approach or management style. It will include:

- Joint R&D Programme – Introduction to Programme and Website;
- Programme Planning and Identification of New Projects;
- R&D Management, including Information on the Route Map;
- Current R&D Programme Schedule (On-going Projects and New Starts);
- R&D Outputs, including Dissemination; and
- Additional information on projects (a) to be tendered, and (b) that have been completed and are in process of publication.

1.2 Thematic Structure

To explain the technical coverage, objectives and management structure of each Theme. This will include:

- Diagram showing the Themes, Theme Leaders and management structure;
- ROAME Statement (Rationale, Objectives etc) for each Theme;
- Main Topic Groups, associated Networks and Business Groups, and other contact details; and
- Interrelationship of Themes.

1.3 Information on Completed R&D

To provide information on the results of individual R&D projects. This will include:

- Summary - a short description of the R&D output and its intended use (up to 150 words), similar to a synopsis for a technical paper. This is the basic introduction to the information available;
- Technical Summary – as in the current Environment Agency R&D Programme, a short (equivalent of 2-page) document covering (a) the project objectives, (b) what it achieved, and (c) intended use of the particular output. This also provides details of DEFRA or Agency contacts, generic target audiences and how a hard copy of the output can be purchased;

- Output – most outputs will be badged DEFRA/EA Publications, Technical Reports or Project Records. Unless there are good reasons otherwise, the output should be made available electronically as a “pdf” file. (It may be necessary to break down some large documents into handleable files smaller than 2Mb); and
- Other Information - A “catch-all” page capable of providing links to, or information on (a) on-going R&D or relevant demonstration projects; (b) other relevant DEFRA/EA projects, and (c) other relevant sites, research , references or other information. List of target audiences.

It is possible for any project to have more than one Output. A small project would simply have an Summary, a Technical Summary and one Output.

1.4 Information on Ongoing R&D

To provide information on on-going projects. Where necessary, a *Summary* can be provided to augment the information that is given about the project in the Programme Schedule.

1.5 General Information and Communication

To provide related information that helps to establish the context of the Joint R&D Programme. To provide conduits to other information areas. To ask questions. This will include:

- List of other relevant references on FCD practice;
- List of past DEFRA (and MAFF) and Agency R&D outputs relevant to FCD practice;
- Search tool to search by Theme, title or keyword (logical to use existing DEFRA keywords based on Frascati and Nabs taxonomy);
- Online ordering of outputs from EA Dissemination Centre; and
- Enquiry form (initially we must avoid the site being a discussion forum)
- Frequently Asked Questions (FAQs).

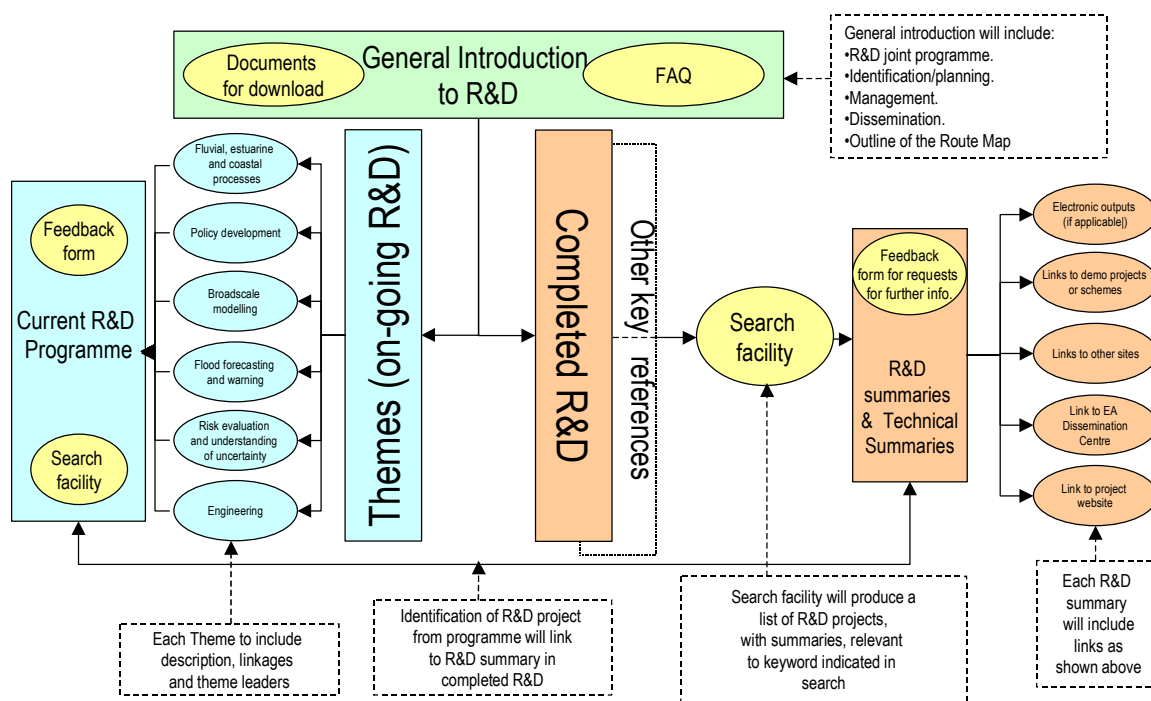


Figure A.3.1 Proposed structure for website

The website must be backed up by a list of keywords for ease of reference and searching using a site-based tool. This will be aligned with a taxonomy for R&D, and must also be agreed with DEFRA and EA officers responsible for information and communications.

The lists of other relevant references and past R&D outputs should be developed in the future to become a structured, bibliographical, reference source. (This activity could link into the production of a knowledge map for the whole Environment Agency and could be linked to that wider Knowledge Management project).

2 Style of the site

The website should be a single Internet web site (which is duplicated or linked on others Intranets). To promote the site, cross-links should be added to other websites. The structure of the site must be such that its development can be staged. It must draw on Output Summaries, Technical Summaries and Outputs that will be posted through the Agency's Dissemination Centre and Website for the overall Environment Agency R&D Programme. (The Agency's Dissemination Centre will be fully upgraded to electronic publication in mid 2002).

The vision for the Flood and Coastal Defence R&D Website is a one-stop-shop for all the necessary information. For example users will not wish to visit a number of different web sites or have to contact offices in order to get to the information they require. However the site should not be expected to hold all R&D reports and detailed information, hence the need for cross-links to other relevant sites. This is particularly relevant to the collaborative projects and networks that are now in place.

In the long term, information presented on the website must be suitably designed and presented for web use. However, in the short term, the approach to the development of the site and access to information must recognise that some information that is presented on the site was not originally prepared for electronic publication. In the short term, procedures

need to avoid excessive special preparation of the programme and project material to be placed on the site. The Agency's R&D Service is currently drafting guidance for authors of "mixed use" documents – i.e. those needing to be disseminated in both electronic and paper form. (The relevant DEFRA group should also advise here). It is not intended that all the Project Records (technical supporting information) should necessarily be placed on the website.

In the longer term, some R&D outputs may be produced in a strongly web-based format. These will be tiered through different levels of information/detail in order to allow the user to retrieve the level of information they desire (e.g. general information; more detailed introduction; detailed design guidance).

The site must be as intuitive as possible to use with clear help information. Information should be easily read from the screen and, when necessary, easily printed. Likewise, because users should not be expected to download excessive information, summary information of the project and links on how to obtain the full document must always be clearly signposted.

In order to assure the quality of data and its use, there need to be protocols and provisos attached to the website. These will need to be agreed with DEFRA and Agency officers responsible for internet policy.

The website should have some interaction (for example, the feedback form) to allow a loop of knowledge generation and encouragement of R&D users. However, the introduction of full feedback may need to be staged to avoid excessive demands in the short term. In the longer term, the feedback form will also serve as a tool to measure the success of the website, which should be accompanied by a website hits meter.

3 Management

The Flood and Coastal Defence R&D website should ideally form a public part of the existing restricted site currently used for management purposes (this part remaining hidden from public view). It will be necessary to merge this onto the Environment Agency or other organisations' Intranets.

The site should be designed and established by web professionals to ensure that it is smooth and quick to operate. It will be a high level resource and should therefore be managed properly and regularly reviewed, to assure quality, content and effective communication. This will also be necessary in order to support any longer-term development of discussion and feedback (e.g. a forum).

Use of the website must be accompanied by the development of electronic lists of user groups and individuals who would be notified by email, with the Technical Summary, when a new output or programme is published on the site.

The discrete nature of the site and on-going development requirements would enable its management to be supported by an organisation external to DEFRA or the Environment Agency. The appropriate level of in-house and external resources must be considered by DEFRA and Environment Agency in developing the detailed specification for the website.

APPENDIX 4 STUDY TERMS OF REFERENCE

HOCO 418

MAFF/Environment Agency Flood and Coastal Defence R&D Programme

R & D Project W5G (00) 06:

Specification for study on improving the implementation and adoption of R&D results

1 Background

1.1 The Ministry of Agriculture, Fisheries and Food (MAFF) and the Environment Agency (Agency) commenced a Joint R&D Programme in Flood and Coastal Defence in July 2000. This followed the recommendations in 1999 of the independent Advisory Committee on Flood and Coastal Defence R&D chaired by Professor Edmund Penning-Rowsell. A key conclusion of the Advisory Committee was that the *“true value of R&D funded by MAFF and the Agency is not being realised due to a fragmented approach to implementation and adoption of research”*. The section of the Report of the Advisory Committee dealing with *“Enhancing Research Take-up”* is attached as Appendix 1 <of this report>.

1.2 MAFF and the Agency define “uptake” as covering both the passive dissemination of R&D results (e.g. in a technical journal) and the active implementation of R&D results (e.g. in a guidance manual which the user is trained to use). Both organisations recognise that improvements can be made to the current processes of uptake of research and development (R&D) in Flood and Coastal Defence inherited from their previous R&D programmes.

Uptake of R&D can cover a number of different processes, including:

- a. Dissemination of interim results and information on the progress of research projects to the research and user communities;
- b. Publicity on specific projects, particularly those of interest to the public or to the research or user communities concerned;
- c. Implementation of the R&D outputs by the intended users, together with the provision of any necessary training in the use of these products;
- d. Dissemination of information on the availability and benefits of new products to other stakeholders playing a part in the effective implementation of the R&D outputs (e.g. senior managers who might “champion” the use of a new product);
- e. On-going marketing and sales of outputs to users; and
- f. Dissemination of general information on research projects as published in the R&D Programme (i.e. the listing of projects currently underway or planned for the future). While the latter does not deal with the results of R&D, it helps to create awareness and understanding of the issues covered in the joint programme.

1.3 Some of the processes dealing with uptake of R&D findings are of course specific to the projects concerned – for example, the details in the implementation plan for

launching the output from a specific project. Other issues may be specific to the funder concerned, or to the work plan in a particular Theme.

1.4 However, a range of issues that determine the effectiveness of R&D uptake is likely to be common across the new Programme. This Study will develop a general framework for the uptake of R&D results from the joint programme. The outputs of the Study will enable MAFF and the Agency to put in place a range of mechanisms and processes that are available to support the uptake of the results of any R&D project. This will help those responsible for delivering the results of any R&D project in the joint programme to put in place the best approach for uptake of those results.

The proposed framework should follow best current practice in R&D uptake (e.g. use of Web Sites; links to CPD training etc) and must be appropriate to the general practices of MAFF and the Agency. It should also link into, or make an effective transition from, the approaches currently used by MAFF and the Agency to uptake and information management of results from their respective R&D Programmes.

2 Overall objective

To identify, and recommend a plan for setting up, a user-oriented framework and related services for the effective implementation and adoption of R&D results and other related information from the joint MAFF/Agency Flood and Coastal Defence R&D Programme.

“Users” includes all parties which MAFF and the Agency intend should use and benefit from the results of the joint programme. Users may be their own staff or outside their organisations.

3 Specific objectives

- a. To identify the main factors currently limiting the effectiveness of uptake of the results of R&D.
- b. To categorise the different types of uptake and user involved with the Joint R&D Programme.
- c. To produce a Route Map for guiding R&D managers when considering the uptake requirements for any particular R&D project.
- d. To recommend a preferred structure, style and management approach for a website for the Joint R&D Programme.
- e. To recommend model approaches to implementation of R&D outputs by key user groups.
- f. To identify other approaches and/or services (internal or external) for assisting uptake which could be set up and/or made available.
- g. To propose a programme of additions and modifications to the current MAFF and Agency uptake procedures and mechanisms.
- h. To produce a plan and supporting notes and specifications for introducing the various improvements in uptake for the Joint R&D Programme.

APPENDIX 5 CONSULTEES

The individuals consulted (as of August 2001) were selected to provide input across a broad range of perspectives. Consultation was by open discussions, interviews, telephone, email, post and the project workshop.

Mr	Peter	Allen-Williams	DEFRA – Flood & Coastal Defence
Mr	Brian	Arkell	Environment Agency, Thames Region
Ms	Linda	Aucott	DEFRA – Flood & Coastal Defence
Mr	Peter	Borrows	Environment Agency – Thames Region
Dr	Mervyn	Bramley	R&D Theme Leaders, Engineering
Mr	Colin	Bye	North Norfolk DC
Dr	David	Calderbank	DEFRA – CSG
Dr	Ann	Calver	CEH Wallingford
Mr	Stefan	Carlyle	Environment Agency, Head Office
Mr	Mike	Child	R&D Theme Leader, Policy Development
Dr	Chris	Collier	University of Salford
Mr	David	Collins	DEFRA – Environment
Mr	Bill	Cooper	ABP Research and Consultancy Ltd
Ms	Gill	Davies	Environment Agency, R&D Service
Mr	Mark	Dixon	Environment Agency, Anglian Region
Mr	Mike	Eastwell	Environment Agency, Science/Technical Information Service
Mr	James	Edwards	Environment Agency, Environmental Protection
Mr	Brian	Empson	Environment Agency, Flood Defence
Prof	Edward	Evans	R&D Theme Leader, Broad-Scale Modelling
Mr	Roger	Flather	Proudman Oceanographic Laboratory
Dr	Chris	Fleming	Halcrow Group Ltd
Dr	Mary	Fridlington	EPSRC
Mr	Roland	Grzybek	Independent
Dr	Alan	Gustard	CEH Wallingford
Dr	Jim	Hall	University of Bristol
Mr	Jim	Haywood	R&D Theme Leader, Flood Forecasting & Warning
Mr	Gordon	Heald	Environment Agency, NCPM Service
Dr	Peter	Hedges	EPSRC
Mr	Tony	Higgs	Halcrow Group Ltd
Mr	Nick	Holden	Environment Agency, NCEDS Bath

Dr	John	Holmes	Environment Agency, R&D Unit
Mr	Richard	Horrocks	Environment Agency, South West Region
Mr	Toby	Hutcherson	Environment Agency, R&D Unit
Mr	Jim	Hutchinson	DEFRA – Flood & Coastal Defence
Dr	Donald	Knight	The University of Birmingham
Mr	Steve	Knowles	Environment Agency, National Training Service
Mr	Gary	Lane	Environment Agency, Head Office
Dr	Paul	Leonard	DEFRA – Chief Scientist Group
Mr	Robin	McInnes	SCOPAC Officers Working Group
Dr	Ian	Meadowcroft	R&D Theme Leader, Risk & Uncertainty
Mr	Kieran	Morris	Environment Agency, NCPM Service
Prof	Malcolm	Newson	University of Newcastle upon Tyne
Mr	David	Noble	Association of Drainage Authorities
Mr	Terry	Oakes	Terry Oakes Associates
Mr	Michael	Owen	Coastal Engineering Consultant
Mr	Hugh	Payne	The National Assembly for Wales
Mr	David	Pelleymounter	Environment Agency, NCPM Services
Prof	Edmund	Penning-Rowse	Middlesex University
Mr	Andy	Pepper	ATPEC Ltd
Dr	John	Pos	R&D Theme Leader, Processes
Ms	Meg	Postle	RPA Ltd
Mr	David	Ramsbottom	HR Wallingford Ltd
Ms	Jane	Rawson	Environment Agency, Anglian Region
Mr	David	Richardson	DEFRA – Flood & Coastal Defence
Mr	Charlie	Rickard	Mott MacDonald Group Ltd
Mr	Keith	Riddell	Babtie Group Ltd
Prof	Robert	Sellin	University of Bristol
Mr	Jonathan	Simm	HR Wallingford Ltd
Mr	Alan	Sweeting	Environment Agency, R&D Service
Mr	Ian	Townend	ABP Research & Consultancy Ltd
Prof	Kerry	Turner	University of East Anglia
Mrs	Jean	Venables	Chair, Thames RFDC

APPENDIX 6 COMMUNICATIONS THEORY AND KNOWLEDGE MANAGEMENT RELEVANT TO R&D

1 Basic communications theory

The following information may be useful when considering the basic approaches to adopt in communicating R&D outputs. The information simplifies communications theory to aid understanding of the principles involved so that you can apply them on your project. The approach put forwards here should help bring together the discrete forms of output from a project into a coherent approach to disseminating, implementing, and adopting R&D findings.

The key elements in the communication process are shown below in Figure A.6.1. The **Project** (in this case anything issued by the Project Manager, the researchers, or anyone else communicating on the project) presents the information in a particular **format**. This, in essence, is sending out a **message**. The **target audience** will base its **interpretation** of the message on how it has been sent and who has sent it, as well as the message contents. This will generate a **response** (either positive or negative) to the message. **Feedback** from the target audience is essential to ensure that the project is influenced properly (this may require proactive approaches to obtain this). The message is, however, affected by **noise** – other messages that compete and interfere with the intended communication. Noise is a major factor for most flood and coastal defence practitioners, who may feel bombarded by guidance and information. Effective communication targeted to their needs is, therefore, critical to ensure a successful project outcome. This may not be easy to achieve and will require the investment of time to work.

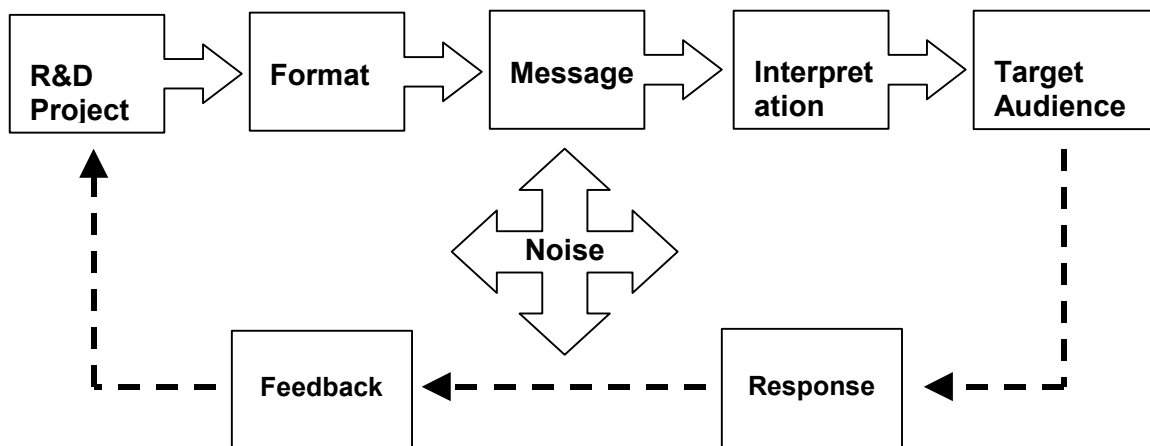


Figure A.6.1 Elements in the communication process (modified from Kotler, 1997)

Many factors influence the effectiveness of this communications loop. These include the personal status of the sender, the target audience's existing opinions, and the importance of the subject to them. The most effective communication is often on subjects that do not challenge the target audience's fundamental values, this can be a challenge for R&D work that may be doing just that! There are eight steps in developing an effective communication and promotion programme:

Step 1. Identify the target audience. This will influence decisions on what to say, how to say it, when to say it, and where to say it. The awareness of the R&D issue, readiness to accept new information, and format preferences need be considered.

Step 2. Determine the message objectives. This will vary depending on the nature of the R&D work and the stage the project is at (or the part of the project relating to the message). Various communications models consider that the message should have one of the following three objectives:

- Awareness – the audience are made aware of the R&D project. Their attention is drawn to it and they now have knowledge that it exists;
- Interest – The audience are made interested in the R&D, they begin to evaluate it and express preferences on how they would like to see things. This should aim to develop a liking for the R&D, desire to use it, and support for its use; and
- Action – The target audience receive, or buy into, the findings (note findings may be promoting or rejecting a concept), or perhaps develop a wish to be able to trial them, and then act upon them and adopt them as their own.

Step 3. Design the message. The ideal messages will, within themselves, grab the users' attention, hold their interest, create a desire, and produce an action. In practice a single message will rarely perform all these functions. In each case the message has to work for the target audience so their preferences need to be considered.

Step 4. Select the communication channels. There are two types of communication channel: personal (active) and non-personal (passive). Personal communication can be face to face, by telephone, by email, or in a workshop or meeting. Personal communication includes informal word-of-mouth discussions, which are effective because many people actively seek out the opinions of experts or respected colleagues. Non-personal communications channels do not have much interaction with target audiences, the most common format is any publication in print, production of software or databases etc. Although not so effective as personal communication, these methods are used to create awareness, stimulate personal communication, and deliver detailed information.

Step 5. Establish the budget. The amount to spend on promoting R&D uptake is difficult to determine. Simple methods of establishing the budget (e.g. the affordable amount, a percentage of total R&D spend) have no rational basis and tend to focus attention on costs rather than benefits. A more rigorous approach is to set objectives for individual projects (or groups of projects with similar target audiences), and estimate the costs for each project. This might well show that for a project to have the desired outcome with real implementation and adoption of it, the spend on information communication should exceed the technical and management aspects of the work.

Step 6. Decide on the mix of formats. The effectiveness of promotional tools varies depending on whether target audience are at the *awareness interest* or *action stage* (see step 2 above). The following diagram illustrates what tools may be most effective at the different stages.

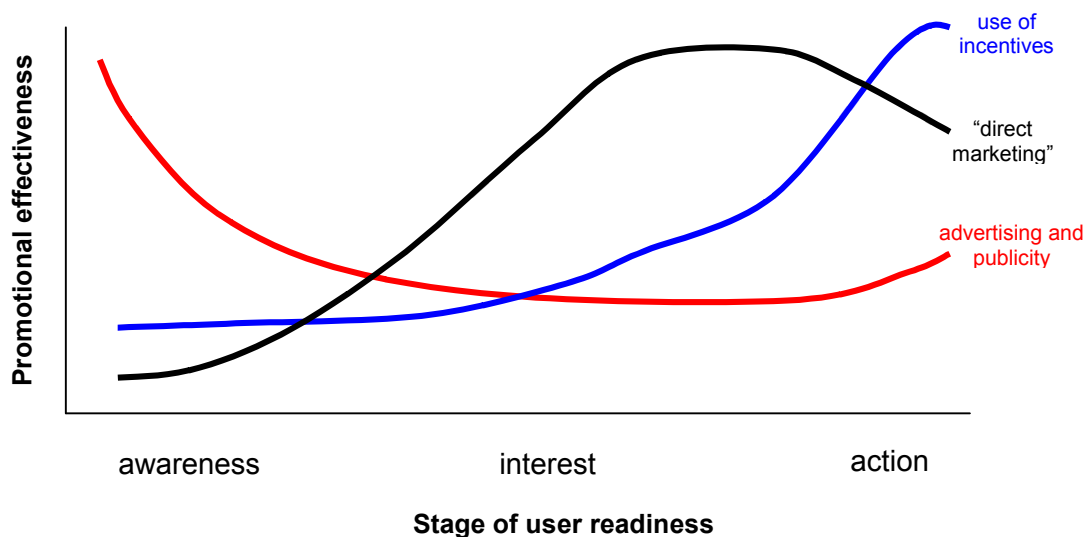


Figure A.6.2 Effectiveness of promotional tools

The most effective way to create awareness of R&D is through advertising and publicity. To develop interest the project needs to ‘marketed’ to the target audience. They need to be informed, involved and convinced that this is relevant for them. This will be key in generating feedback and developing the R&D to meet their needs (hence the final outputs are suited to the target audience). To create action some ‘marketing’ is still needed but incentives, such as personal development or providing the means to comply to new policy or legislation, will be most effective in reaching adoption of the findings.

Step 7. Measure the results. When the promotional plan has been implemented, the impact on the target audience must be measured. If the promotion included objectives to raise awareness or increase understanding, these should also be measured. Some direct measures may be to quantify the number of outputs disseminated but it will also be important to examine the behavioural changes resulting from the outputs and this may require follow-up work to identify this and consider further actions required.

Step 8. Manage and co-ordinate integrated communications. The range of communication channels, messages, and users means that co-ordination is important. Different communication strands must be linked together to create a coherent plan for communication.

2 Knowledge Management

The relatively new discipline of Knowledge Management (KM) offers several key messages that are relevant to R&D dissemination and implementation. Many of the points made below are already recognised by DEFRA and the Environment Agency, who are both implementing KM strategies. The points are included here to stress their relevance to R&D uptake.

2.1 Cultural issues vs. ICT issues

It is widely recognised by KM specialists that organisations need a culture of sharing if knowledge management is to be successful. The cultural issues are far more important than sophisticated knowledge sharing technology - although some tools, such as an intranet, can

be used to help achieve behavioural change. Practical steps that can be taken to improve the culture include:

- Training in learning skills such as brainstorming and problem solving;
- The introduction of incentives to share knowledge – through appraisal and reward systems;
- Cross-functional workshops on common issues (to help break down organisational barriers);
- The introduction of demonstration and experimentation projects.
- Project reviews ('lessons learned' sessions);
- Encouraging people to network (including forming communities of practice); and
- The introduction of systems for sharing information, e.g. intranet, telephone helplines, libraries.

It is also essential to have visible support from top management, who can lead by example. A simple start is to get senior executives to share information about themselves on an intranet home page.

2.2 Personalisation, codification, and incentives

There are two fundamental knowledge management strategies: a codification approach, in which knowledge is captured in a database; and a personalisation approach, in which individuals share their intuition and experience with others – usually face-to-face. The codification approach is suitable for businesses that offer standard, mature services; whereas the personalisation approach is suited to organisations that customise their services and need to innovate. In practice a strategy is usually 80:20 codification: personalisation or vice versa.

FCD requires the use of standards and best practice, and solutions need to be applied consistently across different regions. A codification strategy is therefore appropriate, with a more personal approach where new ideas are being developed and tested.

Each approach requires incentives for people to share knowledge. In the codification model, an appropriate incentive is to include individuals' contributions to the database in their performance reviews. In the personalisation model, an appropriate incentive is to link pay to the amount of direct help individuals give to their colleagues.

APPENDIX 7 EXAMPLES OF COMMUNICATION ACTIVITIES

1 **Communication strategies used in the construction industry**

The UK construction industry is undergoing significant change, for which effective learning and knowledge management are essential. Since DETR published Egan's *Rethinking construction* in 1998, a plethora of initiatives have been created to support learning and change in the industry. Two of the largest initiatives are the Movement for Innovation (M⁴I), and Construction Best Practice Programme (CBPP).

These employ a variety of levers and mechanisms for diffusion of knowledge - including case studies, guides and toolkits, KPIs, benchmarking visits to other sectors, best practice workshops, and demonstration projects. Some of these mechanisms (with adaptation and/or development) will be suitable for Flood and Coastal Defence R&D.

Other initiatives described here are the Knowledge Exchange, Partners in Innovation, and Co-construct.

It is worth noting that the number of current initiatives is confusing the construction industry. Some will argue that the more initiatives there are, the better – but people who are reluctant to change will use confusion as an excuse for doing nothing. The overall effect is to reduce the impact of improvement initiatives. To avoid this pitfall, DEFRA and the Environment Agency should keep the number of initiatives and information sources to a minimum and combine resources wherever possible.

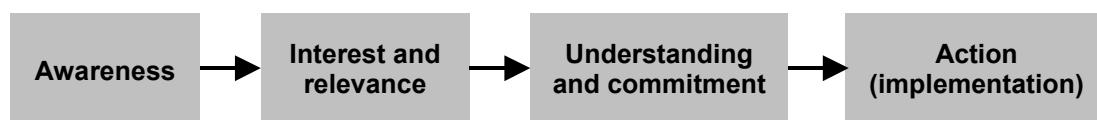
1.1 **The Construction Best Practice Programme (CBPP)**

CBPP was created in 1998 to help the construction industry improve its efficiency, quality, and competitiveness. CBPP raises awareness of the benefits of best practice and provides guidance and advice to UK construction and client organisations so that they have the knowledge and skills required to implement change. The main focus is transformation of outmoded management practices and business cultures.

The CBPP holds two important lessons for Flood and Coastal Defence R&D. The first is its excellent application of communications theory to industry change and improvement; and the second is the importance of cultural issues in learning and change management.

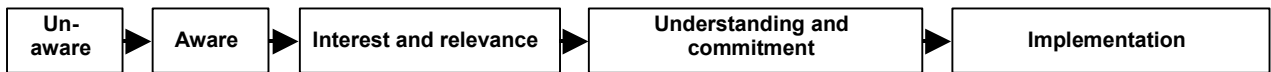
1.1.1 **Application of communications theory**

CBPP's strategy is based on the recognition that it is essentially a communication and promotion programme. It has adopted the following response hierarchy model, which is used as a framework for all its activities.

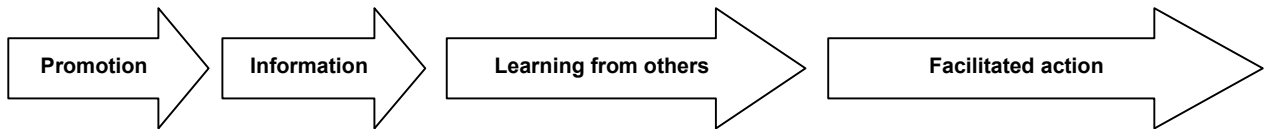


Services have been developed for organisations and individuals at different stages in this model (see Figure A.7.1). The initial focus was on raising *awareness* of CBPP and of best practice topics such as partnering and supply chain management. As people have become aware of best practice, the focus has shifted towards the right hand side of the model.

Status of organisation



Generic CBPP activity



Specific CBPP activity

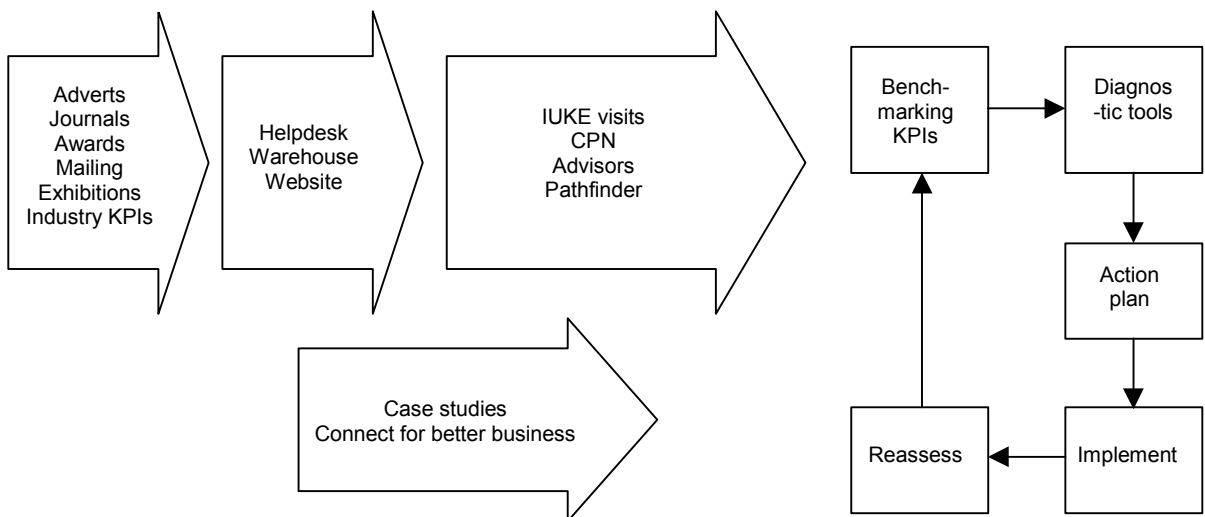


Figure A.7.1 The CBPP “Funnel diagram”

1.1.2 The importance of cultural issues

Although CBPP has been successful in changing the attitudes and behaviour of organisations in its target audience, its effects are limited.

In any change programme, there are some organisations and individuals who will embrace new ideas, and others who will find it more difficult. Those who are not readily capable of change are excluded from the CBPP target audience – hence the limited impact.

Wider change will occur only when the industry changes its values and management styles and “learns how to learn”. The message for R&D is not to ignore the cultural issues (constraint types 2 and 3), as these will limit the impact of changes to R&D systems.

1.1.3 Potential for links between R&D and CBPP

CBPP is concerned only with management practices, and is not therefore a suitable vehicle for disseminating R&D results.

Elements which could be copied are the overall strategy and some of the services and activities – particularly the website (www.cbpp.org.uk), the helpdesk, and the data warehouse (a database that contains all the case studies, guidance documents, toolkits, etc.).

It would also be worthwhile to adopt the CBPP practice of making information available in a variety of media and formats (print and electronic).

1.2 The Movement for Innovation (M⁴I)

M⁴I aims to lead radical improvement in construction through demonstration and dissemination of best practice and innovation. Its main activities are demonstration projects, clusters, and working groups.

The demonstration projects seek to develop innovation in management practices, construction techniques, and construction processes. Projects are proposed by industry, and accepted on the basis that the project team and client are using innovative practices to improve efficiency and quality. Projects have an obligation to benchmark performance and share their experiences with the rest of industry. In return, the project teams receive PR benefits and the opportunity to learn from others. The Environment Agency already participates in demonstration projects.

The projects are reviewed by regional Cluster groups, where demonstration project teams meet to share information and test and plan new ideas. The Clusters are linked to CBPP's Best Practice Clubs, and engage with local initiatives by other organisations such as CITB, Universities and Regeneration Agencies.

M⁴I has studied the way people engage with demonstration projects and identified the following positive factors:

- Willingness to openly discuss innovations with others, in spite of competition issues;
- Closer working within project teams, including a move away from a blame culture towards joint responsibility;
- A focus on successful outcomes – particularly the need for all partners to win.
- The ability to measure the value and effectiveness of innovation, using the national KPIs for construction;
- Improvements in business performance; and
- Learning from others.

Like CBPP, M⁴I can only reach those organisations that are willing to innovate and change. Critics of M⁴I say that being involved with demonstration projects is bureaucratic and time-consuming (although the process has been greatly simplified), and that it is difficult to see the benefits to the wider industry. The greatest benefits are achieved through active involvement in the demonstration projects and cluster groups.

M⁴I is currently seeking new demonstration projects and is interested in projects with a significant R&D dimension. DEFRA and the Environment Agency should consider plugging pilot/experimental projects into the M⁴I network. The benefits would be visibility (being seen to participate in relevant external initiatives); external recognition and kudos for project teams; and access to advice. Involvement would also help to change organisational culture (see bullet list above) and create champions for further change.

1.3 The Knowledge Exchange and Co-Construct

Both these initiatives are attempts to provide a “one stop shop” for on-line information. Each provides a website with a single point search facility, so that users can simultaneously search several relevant sites.

The Knowledge Exchange (run by M⁴I) connects organisations committed to *Rethinking Construction* and therefore focuses on management practices. Users can search by keyword or theme, and search across all portals or across a selection. Portals include:

- Research In Practice (this accesses the Co-Construct members’ sites);
- The Learning Network;
- Trade Associations;
- Professional bodies;
- Government;
- Specialist suppliers;
- Contractors;
- Consultants;
- Clients;
- News;
- Project managers; and
- Manufacturers.

Co-Construct is a joint initiative between five construction research associations (BSRIA, CIRIA, Concrete Society, SCI and TRADA) designed to promote best practice in the construction industry. Like the Knowledge Exchange, the website allows users to search across all sites for news, events, projects, publications, and journals/newsletters.

The “one stop shop” approach is a useful one that could be adopted by DEFRA and the Environment Agency to help FCD users find information quickly, wherever it currently resides. For example, the FCD website could provide a single point search facility for a number of other sites, including those of the Environment Agency, DEFRA (FCD), researchers, consultants, local authorities, and contractors.

The feasibility of such an approach needs to be assessed by an IT/Internet specialist.

1.4 Partners in Innovation (PII)

PII is a *collaborative* scheme that provides up to half the costs of research and innovation projects within the construction sector. It is run as an annual competition - open to all UK companies, industry bodies, institutions, research and technology organisations and universities.

PII was developed and run by DETR. Following the changes to Government Departments in June 2001, it will be continued by DTI and DTRA in the short term. Its longer term future is uncertain.

DETR were keen to ensure that the work they funded under PII reached as many organisations as possible, and were clearly focused on outcomes rather than outputs. They commissioned Taylor Woodrow to examine the whole issue of R&D uptake. Taylor

Woodrow found that although research successfully identified and targeted real industry concerns, uptake of the outputs was variable. Taylor Woodrow found that successful exploitation bears no relation to the size or type of participating companies. They identified four common success factors:

- A clearly defined demand for the research work;
- Active stakeholder involvement;
- A champion for the research; and
- A champion for the application of the findings.

DETR responded to these findings by changing the guidance to applicants for PII funding. Each proposal has to include an outputs and communication plan, and the quality of the proposed communication and dissemination activities influence the success of the proposal.

PII appraisers use the following criteria to judge whether enough thought has been given to the target audience and the feasibility of reaching them:

- What is the function or purpose of the output?
- What is the timing and duration of the communication activities?
- Who wants the information, what is the size of the target audience, and what proportion of it will be targeted by the project?
- What are the routes to the audience – how will the outputs be promoted and how will users gain access? Who will champion the research and its exploitation?
- What business benefit will users gain?
- What exploitation rights will they have?
- Will there be resource costs to the user associated with adoption of the output? And what if any charges will be made to the user by the project team?
- For ongoing outputs (e.g. websites), what arrangements will be made for longer-term maintenance beyond the life of the project?

Once a proposal has been accepted, communications aspects of the work are supervised by managing agents (appointed by DETR as expert R&D managers). Researchers are often far more interested (and experienced) in the technical aspects of the work, so experience and knowledge of the managing agent therefore influences the success of a project. There is a danger that production and implementation of the communications plan can become a box-ticking exercise. This highlights the need for professional, trained, knowledgeable people with marketing and communications expertise to work with researchers.

1.5 CIRIA

As a member based Research Association, CIRIA is a leading and well-respected route for undertaking and disseminating the results of collaborative R&D projects that construction industry practitioners have selected as central to their needs. Members include many client organisations and industry regulators as well as supply-side companies. With an aggregate turnover on the supply-side in excess of £18Bn, CIRIA members represent close to 30% of the industry's annual turnover of £65Bn. At any time, CIRIA has between 50 and 60 projects under way supported by funding from members and by in-kind contributions. In 2000 a total of 840 industry representatives served on CIRIA project steering groups and

other committees to ensure that the research is focused on industry needs and to validate the outputs.

Most CIRIA projects are jointly funded by a group of organisations often including both of the private and public sectors. Funders are able to initiate a project of value to them at a relatively small fraction of its cost. However, financial savings are not the only benefit of collaboration. CIRIA, through its members and its industry standing is also able to bring in contributions of knowledge and time from a range of companies, which add significant further value to the project. These companies, and CIRIA's management approach, also bring communications skills into the projects. Also, CIRIA's established methods of collaborative working, which involve consensus forming, peer review and dissemination routes have earned CIRIA publications a reputation of authority and independence.

2 Communication strategies used outside the construction industry

2.1 Experience from the NHS

The NHS decided to look at R&D uptake because of disparities between clinical practice and research evidence of effective practice, and because of the need to demonstrate that public money spent on R&D results in benefits for patients.

The results are of interest to the R&D programme for two reasons:

Health practitioners, like engineers, are professional people who identify strongly with their profession. They are often poor at real (double-loop) learning. They will take advice from their peers more readily than from their managers.

Health professionals and engineers both feel overburdened and under supported, so need help to manage change rather than feel like its victims.

The NHS work recommends a number of steps to support the process of learning and change. The steps are listed below, and have been modified to reflect FCD rather than healthcare needs.

1. Keeping abreast of new knowledge. Reliable, relevant information is needed at the point of decision without appreciable delay. Important information needs to be summarised in a rigorous way and presented so busy professionals can easily digest it. Investment in IT should make this possible.

2. Implementing knowledge. R&D findings can influence decisions at many levels – individual design decisions, best practice guidance, policy development, etc. – but only if knowledge is translated into action. Changes to the way things are done often require organisational and culture change before they can be implemented. To close the gap between current and desired practice, the following steps are needed:

- Define the appropriate “message”, i.e. information to be used;
- Decide which processes need to be altered;
- Involve the key players, i.e. those who will implement change or who are in a position to influence the changes;
- Identify the barriers to change and how to overcome them;

- Decide on specific interventions to promote change, e.g. guidelines, educational programmes, etc;
- Identify levers for change, i.e. existing mechanisms which can be used to promote change (e.g. financial incentives to attend educational programmes, placing of appropriate questions in professional examinations); and
- Determine whether practice has changed along the desired lines.

There are also characteristics of the “message” which need to be considered. Aspects of content are:

- Validity;
- Generalise (i.e. settings in which it is relevant);
- Applicability (i.e. projects to which it is relevant);
- Scope; and
- Format and presentation (e.g. written or computerised guidelines, absolute versus relative risk reductions).

Other characteristics of the message are:

- Source of the message (e.g. professional body, DEFRA);
- The channels of communication;
- The target audience;
- Timing of initial launch and frequency of updating; and
- The mechanism for updating the message.

Note the similarity between the above lists and the steps needed for a successful communications and promotion programme.

3. Linking research with practice. There need to be closer links between research and practice so that research is relevant to practitioners’ needs and practitioners are willing to participate in research.

4. Interaction between purchasers and providers. Purchasers (clients) as well as providers (e.g. design engineers) should be involved in the application of research findings to practice.

5. Making implementation an integral part of training. Greater emphasis should be given to encouraging practitioners to spend time learning to use and implement research findings effectively.

Further insights from the NHS work are given in the tables below:

Table a: Interventions to promote professional behavioural change

<p>Consistently effective</p> <p>Educational outreach visits; Reminders (manual or computerised); Multifaceted interventions (a combination of interventions); and Interactive educational meetings (workshops that include discussion or practice).</p>
<p>Mixed effects</p> <p>Audit and feedback (any summary of performance); Local opinion leaders (use of practitioners nominated by their colleagues as ‘educationally influential’); and Local consensus process (inclusion of practitioners in discussion).</p>
<p>Little or no effect</p> <p>Educational materials (published or printed recommendations for good practice, including guidelines and electronic publications); and Didactic educational meetings (lectures).</p>

Table b: Factors that affect the use of research findings

	Individual and team factors	Organisational and R&D factors
Enhancing factors	<p>Dedicated, confident leadership. Easy access to high speed computing equipment. Good quality, relevant databases . Time and staff support (e.g. to cover during training). Flexibility in the project to allow team ownership and incremental change. Good relationships. Good quality training, relevant to information needs. Reasonable keyboard and computing skills.</p>	<p>Services to provide R&D findings when and where needed: databases, librarian and computing support, document delivery system. Information strategy at high level. Sustained support for lead practitioners (e.g. money for training, encouragement). Good quality training. Good salesmanship and assistance from the initiator of the project.</p>
Barriers	<p>Uncommitted leader: overworked; uncertain about benefits; threatened by new approach. Insufficient external support for training and managing change. Inadequate computing equipment and databases. Poor relationships. Poor keyboard and computing skills.</p>	<p>Inadequate availability of R&D findings. Lack of management commitment to lead practitioners. Lack of time and resources for ongoing training and adaptation around the use of R&D findings. Poor training programmes.</p>

APPENDIX 8 LIST OF DOCUMENTATION REVIEWED

R&D Management Documents

Joint MAFF/DEFRA/Environment Agency

- ROAME A Policy Development;
- Update on DEFRA/Environment Agency flood defence R&D programme – 2001/02; and
- Environment Agency FD R&D Commission – Organisation structure for theme programme development and project management.

MAFF/DEFRA

- CSG 15: Research and development - Final project report;
- CSG 15A: Research and development - Supplementary information to final project report;
- CSG 7: Application for a research contract with MAFF;
- CSG 12: Annual/interim project report - financial year;
- Note on the MAFF review of the aquatic environment monitoring and assessment R&D programme held on the 2nd June 200;
- Note of the MAFF review held on 11 March 1999 - 'Scientific support for FEPA Part II 1985 (Deposits in the Sea)';
- Animal health and welfare - research requirements document 2001-2002;
- Guidelines 2000. Scientific advice and policy making; and
- Towards a framework for effective web-based distributed learning.

Environment Agency

- A science plan for the Environment Agency;
- Development of a science plan for the Environment Agency;
- Research and development programme 1998/99 - schedule of proposed new starts
- R&D strategy 1998;
- Research and development in the Environment Agency - a short guide;
- Environment Agency research and development programme. Schedule of on-going projects and proposed new starts in 1999/2000 - collaborators version;
- R&D project management handbook;
- A strategic framework for data and information management in the Environment Agency;
- R&D tasks;
- R&D National service;
- Who's who in R&D;
- Planning guidelines for the 2000/2001 R&D programme PGN2;

- Environment Agency R&D Programme - delivery of R&D benefits R&D PAB(98)53;
- Research and development in the Environment Agency - chief scientist note 1 R&DWG31D;
- Environment Agency - conditions of contract (research contracts); and
- Knowledge@Agency. Driving modernisation by sharing knowledge. R&D technical report X1.

Flood/Coastal Defence Documents

MAFF/DEFRA

- FCDPAG1. Flood and coastal defence project appraisal guidance - overview. Consultation draft version 1.0a; and
- Flood and coastal defence (from MAFF draft science strategy).

Environment Agency

- Flood defence: human resource strategy;
- Environment Agency key behaviours. Flood defence human resource strategy. Working version; and
- NCPM skills questionnaire.

MAFF/DEFRA R&D Outputs

- Flood estimation handbook guidelines part 1 – overview;
- Flood estimation handbook guidelines part 2 - user guide;
- Flood defence. Technical competencies. Area team member. Development control;
- Flood and coastal defence. Research and development annual report 1999-2000;
- Transport of organisms in ship's ballast (example MAFF R&D Technical Summary); and
- Design criteria for enhancing marine habitats within coastal structures: feasibility study.

Environment Agency R&D Outputs

- Catalogue of Environment Agency R&D outputs;
- Review of R&D programme 1996/97;
- SUDS training for the Environment Agency - presentation slides; and
- Reducing flood risk; a framework for change. Internal working draft.

General Documents

MAFF/DEFRA

- The Freedom of Information Act.

Environment Agency

- Effective communication - a guide for Environment Agency authors;
- Environment Agency annual report and accounts 1998/99;
- Spotlight on business environmental performance - report 1999;
- Creating an environmental vision - consultation draft June 2000;
- Enhancing the environment - 25 case studies from Thames Region;
- Local environment agency plan - South Essex. Draft LEAP December 1999;
- Environment Agency annual review 1999-2000;
- Environment Agency annual environmental report 1999-2000;
- The public records act - impact on the Environment Agency;
- Project plan - public records pilot project;
- Science and Technical Information Service (SATIS);
- Head Office Business plan 2000/2001 - part I organisational structures and roles;
- Head Office Business plan 2000/2001 - part II performance, priorities and plans;
- Scientific and technical web sites of interest to Environment Agency staff;
- Environment Agency Publications list;
- Regional planning and customer services managers;
- Area planning and customer services managers;
- Focus (Environment Agency newsletter) January 2001;
- Flood defence emergency response (FDER) project;
- Environment Agency corporate plan 2001/2002;
- Creating an environmental vision and framework for change. Internal working draft;
- An enhanced environment for wildlife: a framework for change. Internal working draft;
- Process industries: a framework for change. Internal working draft;
- A 'greener' business world: a framework for change. Internal working draft;
- Cleaner air for everyone: a framework for change;
- Risks and values;
- An environmental vision - the Environment Agency's contribution to sustainable development;
- Current R&D projects; and
- Environment Agency Annual Report and accounts 1999-2000.

External

- Geographic information: the principles of good data management, and
- Learning to live with rivers. Final report of the Institution of Civil Engineers' presidential commission to review the technical aspects of flood risk management in England and Wales. ICE 2001.