The dissemination of the results of environmental research

A scoping report for the European Environment Agency

Experts' corner report

By Alister Scott

November 2000

SPRU (Science and Tecnhology Policy Research)
Mantell Building, University of Sussex
Falmer, Brighton, BN1 9RF,
Tel: (44) (0) 1273 678986
Email: a.h.scott@sussex.ac.uk

European Environment Agency

Cover design & layout: Folkmann Design A/S

Legal notice

The contents of this report do not necessarily reflect the official opinion of the European Commission or other European Communities institutions. Neither the European Environment Agency nor any person or company acting on behalf of the Agency is responsible for the use that may be made of the information contained in this report.

The EEA's Experts' corner reports

The European Environment Agency (EEA) is mandated to provide information to the Community and the Member States, that will help them to identify, frame, implement and evaluate policies, legislation and other measures on the environment, and to keep the public properly informed about the state of the environment.

In order to provide possible inputs to the developing work programme of the EEA, and to stimulate debate on issues that may contribute to the identification, framing and evaluation of environmental policy measures, the EEA, from time to time, asks independent experts to summarise their views on topical or upcoming issues, so that the EEA can consider publishing them as Experts' corner reports.

Experts' corner reports do not necessarily reflect the views of the EEA, or of any other EU institution: they are the opinions of the author only. However, they are intended to facilitate the broader dissemination of more recent environmental information that may provide useful inputs into the developing environmental agenda. The EEA hopes, therefore, that they will be of interest to the Community, Member States and other environmental stakeholders, whose comments on the contents it would welcome.

A great deal of additional information on the European Union is available on the Internet.
It can be accessed through the Europa server (http://europa.eu.int)

Contents

1. Executive summary

This report reviews relevant knowledge and identifies issues for consideration in implementing the European Environment Agency's new mission to facilitate the dissemination of policy-relevant environmental scientific research. It begins by examining and analysing literature relating to research-policy interactions, primarily from the social sciences; it then relates experiences from disseminating the research of the UK Global Environmental Change program. After summarising existing European environmental research and dissemination efforts, it concludes by offering recommendations to the European Environment Agency on how to proceed with its mandate.

1.1. Review of science-policy literature and research

A review of literature and experience in science-policy interactions provides the following insights on the relations between research and policy:

- There is an increasing interest in European science and policy in exploiting the results of existing research, putting research to use, and interacting with non-academic users of research.
- While a pessimistic view of research use might conclude that it has little impact on the policy process, a more optimistic view looks more broadly at its impact on providing ideas and framing debates. While a simple view looks at 'instrumental utilization' of information, a broader view considers 'conceptual utilization' – the uptake and transfer of ideas in framing issues.
- Experience cautions against an overly linear view of communication between research and society. Research communication is a two-way dialogue involving a diversity of users. Such communication requires interpretation of relevant results, and the utility of such information to policy makers is not guaranteed. One style of research dissemination involves sustained interactivity, coordination, and communication between researchers and practitioners.

Observations have shown that scientific fields that communicate effectively tend to have clear goal statements, engage in frequent communication, address a broadly-anchored 'problem' that relates well to familiar issues, and popularise findings in non-technical language.

The research conducted by the Global Environmental Assessment Project at Harvard University looked specifically at the practical impact and effectiveness of global environmental assessments. Three characteristics which emerged as most important in distinguishing effective assessments were *saliency* (the perceived relevance or value of the assessment to particular groups); *credibility* (the perceived technical authoritativeness to particular constituencies, largely in the scientific community); and *legitimacy* (the perceived fairness of the assessment process, largely in the political community). Factors that lead to effective assessments (through the proximate pathways of credibility, salience, and legitimacy) include historical context (e.g. whether the issue has yet emerged as high-profile), characteristics of the user or audience (a user's interest, capacity, and/or openness), and characteristics of the assessment itself (how the science/policy interface is structured; how participation is determined; how uncertainty and dissent are handled). Implications for the EEA include the importance of timing, the choice of issues, and the need to translate scientific research into accessible forms.

The Global Environmental Assessment Project research also suggests that tensions between science and policy might be alleviated by the existence of 'boundary organisations' – that is, organizations with accountability to both science and policy that serve to facilitate the transfer of useful information. The EEA might see itself as a 'boundary organisation' in seeking to disseminate policy-relevant environmental research.

A number of other studies support these ideas about the interaction between research and policy. A recent review of the use of scientific knowledge in controversial policy issues in The Netherlands by the RMNO is briefly summarized. It concludes that the knowledge used is constrained by the problem framing, is selected to serve powerful socio-economic interests, and is most useful

when used as the basis for a 'negotiated truth' between stakeholders.

A literature review by Huberman (1994) has produced a 'dissemination effort model' that links research context and user context to dissemination effort through intermediaries of 'linkage mechanisms' and 'predictors of local use.' Informed by this model, the EEA could become such an intermediary, providing communication channels and continuity of follow-through, and ensuring the quality of written products, among other functions. The agency might also play a creative, synthesizing role across projects, research teams, and countries.

1.2. Research dissemination experience from the UK Global Environmental Change Programme

The Global Environmental Change Programme of the UK Economic and Social Research Council, a large-scale, multi-year research effort focused on social science perspectives on environmental problems. The programme engaged in multiple efforts to disseminate its research, and focused on dissemination as its main task during its final year. Methods of research dissemination included awareness-raising activities such as the publication of a newsletter and informational materials; disseminating research briefings and summaries of specific projects; synthesizing findings of several projects in topic-driven 'Special Briefings'; identifying the needs of 'users' in the policy and business communities; providing evidence for policy efforts; and encouraging communication and collaboration with user institutions. Efforts within the programme have explored interactive collaborations with research users, and have also used the media as a vehicle for research dissemination (most notably in the case of a Special Briefing on 'The Politics of GM Food'). Key principles of research dissemination suggested by the programme's experiences include the need to identify and concentrate on key, short messages; to use simple, non-specialized and clear language; and to target messages appropriately to different audiences.

1.3. European environmental research and dissemination

A review of existing efforts at environmental research and dissemination in Europe finds that this is a relatively new and emerging area, particularly in the social sciences. Though it is of growing importance, research dissemination is not a priority function of many of the groups involved in research. Examples of forums that support and disseminate environmental research in Europe are DG Research, DG Environment, other Directorates General and agencies of the Commission, and government departments and organisations in member states.

1.4. Roles for the European Environment Agency

The European Environment Agency could play a role in research dissemination in occupying a space that overlaps the research and policy worlds (e.g. as a 'boundary organisation'), as a 'champion' of evidence-based environmental policy, and/or as a customer and supporter of sustainable development research. The EEA's task in undertaking its new research dissemination functions emphasizes neither 'research push' nor 'policy pull' alone: the focus is on combining the two to promote the implementation of sustainable development.

Several concrete actions are suggested for implementing the agency's new research dissemination responsibilities. These are:

- Connecting with research providers
- Identifying key audiences and needs
- Spotting policy opportunities
- Targeting research to key audiences
- Counting researchers as a key audience
- Ensuring benefits for researchers
- Using ouputs as a stepping stone to further dissemination
- Balancing focused and general messages

2. Introduction

'The connected economy isn't just about productivity. It's also about learning, and the way in which knowledge and best practice can be developed, disseminated and applied on a global basis' comments made in the context of sustainability by Sir John Browne, Chief Executive of BP Amoco, BBC Reith Lectures, May 2000.

Science faces a number of serious challenges in the search for sustainability. These challenges are not only technical and methodological, but also moral and procedural (Funtowicz, Ravetz and O'Connor 1998). Citing Chapter 35 of Agenda 21 as noting that 'often there is a communications gap amongst scientists, policy makers and the public at large…', these authors conclude that 'Better processes for science communication are thus a fundamental component in the harnessing of science for sustainability' (p.100).

In 1999, the European Environment Agency (EEA) acquired, as part of its revised regulation, the responsibility to '**assist the Commission in the diffusion of information on the results of relevant environmental research and in a form which can best assist policy development.**' This paper seeks to help the Agency to start implementing this remit by:

- Giving a brief review of recent developments in science policy that are increasingly emphasising the importance of ensuring that maximum benefits are derived from research
- Assessing the literature on the benefits derived from publicly funded research and means of effective research dissemination
- Describing and analysing the experiences of disseminating environmental research from the UK's ESRC Global Environmental Change Research Programme, one of Europe's largest environmental social science research initiatives, for which the author of this report has acted as Assistant Director for a number of years.
- Summarising the current environmental research and associated dissemination activity being undertaken by organisations within the European Commission.
- Making some suggestions as to how the EEA might proceed with research dissemination so as to add value to existing activities.

3. Putting research to use

Publicly funded research and researchers can play a range of different roles in non-academic decision-making. The aim of this section is to give a brief review of recent policy developments and academic thinking in this area so that later discussions about the dissemination of UK and European environmental research can be based on a strong foundation.

First, this section reviews recent changes in European and national science policies that have increasingly emphasised the need for the research community to disseminate and seek applications for research findings. Next, it reviews current academic writing on science policy that suggests that research is becoming more application-oriented and 'interactive' with non-academic users and beneficiaries of research. Finally, it reviews the research literature about the ways in which public research and researchers contribute to wider social developments, how research can be effectively disseminated, and how to assess these contributions.

It is important to understand these issues in order to be able to put the issue of research communication into perspective. The review concludes that the Agency's new role in research dissemination is very timely, and goes with the grain of many recent developments in both science policy and the changing nature of much environmental research.

3.1. Recent changes in European science policy

European science policy has increasingly emphasised the need for research to serve the needs of industry and wider society. As noted on the web site of the European Commission's research directorate, DG Research, 'the main aim of the Community's research policy is to give European industries the means to improve their international competitiveness … Therefore, major European businesses have always played an important role in implementing this policy, and continue to do so. However, this does not mean that the interests of other categories are not taken into account, especially those of the many small and medium-sized enterprises which are crucial to Europe's

industrial fabric' (European Commission 1999a).

This emphasis on research producing benefits for industry is likely to remain a central feature of European research policy. However, recent developments indicate that 'the interests of other categories' of research beneficiaries may be receiving increasing attention. The European Commission's document *Inventing tomorrow. Europe's research at the service of its people* (CEC 1996) emphasised, as the title suggests, the importance of applying European research 'more clearly than ever to ordinary people and their pressing economic and social problems' (Foreword). A theme running through the report is that 'In previous Framework Programmes, not always has enough been done to exploit results (of research)' (p.25).

This document was produced as part of the build up to the introduction of the Fifth Framework Programme (FP5), which has now been launched. According to the Commission's document *Knowledge-Based Europe*, the principal aim of FP5 is 'to help increase the impact of European research on the economy and on society' (European Commission, undated). Again, the document emphasises that 'Europe often has great difficulty in translating the results of research into economic and commercial success'.

A similar set of themes runs through a key recent study published by DG Research: *Society, the Endless Frontier: a European vision of research and innovation policies for the 21st century* (European Commission, 1997). The study finds that research policies, 'having concentrated on political (1950-75) and then economic objectives (1975-95), are today directed towards socio-economic issues such as job creation, health, and environmental issues' (European Commission 1999b). In this 'third phase' of research policy, wider societal objectives are being integrated into governmental support for research and innovation systems. It states that we understand little about the interactions between research, innovation, skills and a range of socio-economic activities and that research on these interactions 'must henceforth be an integral part of the process of innovation itself' (ibid.).

In summary, there is strong recognition that European research is often under-exploited and that future research efforts must give greater emphasis to putting research to use.

3.2. Recent changes in national science policies

National governments have also set increasingly ambitious targets for public research funding bodies in terms of the *impact* or *application* of research. For example, the 1993 *Government Performance and Results Act* in the US requires funding agencies to demonstrate the outputs and outcomes of their activity. Writing in *Science*, Mervis notes that as a result, these agencies are involved in a 'scramble to measure the public impact of research' (Mervis 1996). Researchers are likely to be asked to explain not only what science they undertook but how they disseminated the results and who benefited.

In the UK, the White Paper on Science, Engineering and Technology *Realising Our Potential* (HMSO, 1993) gave a strong message that the aim of government policy for science is 'to achieve a key cultural change: better communication, interaction and mutual understanding between the scientific community, industry and Government Departments' (para. 2, p.5). Indeed the opening sentence of the White Paper is: 'The understanding and application of science are fundamental to the fortunes of modern nations'. The emphasis is on technology, innovation and the needs of industry, but also on 'the importance of the interchange of ideas, skills, know-how and knowledge between the science base and industry' (para. 4, p.6). It is perhaps unfortunate that the heavy emphasis in the White Paper on the benefits of science to industry, as compared to society more generally, has contributed to hostility in some quarters to the idea that science should demonstrate its social benefits. In particular, this emphasis can be contrasted with the wider group of research beneficiaries identified in the European Commission's science policy paper *Inventing Tomorrow* mentioned above.

For research funding bodies (principally Research Councils in the UK), the White Paper has led to some visible changes in practice. In the UK's Economic and Social Research Council, 65 % of its research funding is now organised in nine strategic 'themes' that reflect this revised mission. This places 'special emphasis on meeting the needs of the users of its research and training output, thereby enhancing the UK's industrial competitiveness and quality of life'. Grant applicants are now asked to specify the users of their research, and researchers are required to report on their interactions with users in progress and end-of-award reports (Rip and van der Meulen 1995). Similar changes have been implemented in the policies of other funding bodies.

The above gives a very brief summary of changes in recent national science policy and the ways in which these changes are affecting research. So how have these changes been analysed in the academic science policy literature?

3.3. What does the science policy literature say?

One of the main themes in discussions about science policy in recent years has been summarised by the 'steady state' metaphor (Ziman 1994). This refers to the situation where funding for science is no longer growing at the high rate that has been the norm since 1945. The research system is said to be 'in transition' (Cozzens et al. 1990). In the influential book *The New Production of Knowledge* it is claimed that under such conditions, researchers are experiencing growing pressures to demonstrate the value of what they do in terms of contributions to economic competitiveness, public policy and quality of life (Gibbons et al. 1994). As a result, it is asserted that publicly funded research is now *taking place in the context of application*. This, the authors assert, means that research is: problem-focused rather than based on the development of theory; transdisciplinary rather than based on single disciplines; more accountable and subject to quality control; and more likely to be being undertaken in a wide variety of organisations.

Ruivo has provided a useful summary of discussions about 'phases' in science policy (Ruivo 1994). She analyses the work of many enquiries into the subject and reports a convergence of opinion on three basic paradigms of science policies over time: first, science as the motor of progress ('science push'), second, science as a problem solver ('demand pull') and finally science as a source of strategic opportunity. The latter, current phase is characterised by an emphasis on strategic basic, interdisciplinary and

collaborative research, foresight processes, evaluation and the use of 'interface institutions', all aimed at ensuring that society derives the maximum possible value from the research it funds. Her analysis converges with that in both the European Commission's study *Society, The Endless Frontier* and the more theoretical writings summarised above.

In brief, there seems to be agreement that publicly funded researchers in the most recent phase are under pressure to be increasingly 'interactive' with non-academic users of research and to demonstrate the non-academic value of research.

3.4. How does research contribute to society?

A number of authoritative reports have sought to reveal the relationship between publicly funded research and economic performance. It is important to note that most of the work in this field has concentrated on science and engineering, and not the social sciences. The following were reviewed in a report by SPRU (Science and Technology Policy Research) to the UK Treasury (Martin et al 1996, now updated as Salter 2000):

- *Enabling the Future: Linking Science and Technology to Societal Goals* by the Carnegie Commission on Science, Technology and Government (Carnegie 1992)
- *Research Funding as Investment: Can We Measure the Returns*? Office of Technology Assessment (OTA 1986)
- *Report of the Task Force on the Health of Research*, Chairman's report to the Committee on Science, Space and Technology, US House of Representatives, (Brown 1992)
- *The Government Role in Civilian Technology: Building a New Alliance*, Committee on Science, Engineering and Public Policy, National Academy of Sciences 1992.

The SPRU report highlights the fact that many discussions of the relationship between research and economic performance assume that the principal benefit from research is the provision of new information. The SPRU survey of the literature, however, shows that as well as new information, research provides four other main benefits: skills and problem-solving abilities learned by researchers (which are carried with them when they

move to or work with other organisations); access to networks of experts and information; new instrumentation and methods; and the creation of spin-off companies. The updated report in 2000 report adds a further benefit of research: 'social knowledge about the innovation process'. This acknowledges not just the importance of research in shedding light on how organisations innovate, but also the importance of understanding wider social dynamics of new technologies in society, as demonstrated by the recent difficulties with GM food.

Faulkner has provided an excellent overview of the issues that need to be taken into account in analysing the contributions of social science research (Faulkner 1995). Similar to the above analysis, by studying the contributions from public sector science and engineering she concludes that the benefits lie in three areas: '(i) training through the teaching activities of universities; (ii) largely invisible flows of knowledge and practical assistance; and (iii) tangible products such as inventions which might lead to products. Training is by far the most significant...' (p.2). Most knowledge reaches industry from public sector research 'through informal interactions and reading the literature' (p.3).

The key point to note is that dissemination of research knowledge is not simply in the form of information transmitted through documents – the most commonly and easily recognised form of dissemination – but through training, networks and person-embodied knowledge, often of a 'tacit' or uncodified and informal variety.

However, most of this area of research has focused upon the use of science and engineering knowledge emanating from Universities, rather than policy relevant social science knowledge, which is the main focus of this report, as this is the area of the author's professional experience[1]. Although it is useful to have these reports as an authoritative and thorough basis from which to proceed, the social sciences are likely to be significantly different in both their outputs and the likely ways in which these will be put to use. We therefore need to look elsewhere for further evidence about the contributions made by the social sciences.

3.4.1. Contributions from the social sciences
The social science information used by companies in innovation or by policy makers in the development of policy comes from a

diverse range of sources, many of them internal to the organisations concerned rather than from the research community. This is a robust finding from the above studies and research in the 'research utilization' community, the findings of which are embodied in journals such as *Knowledge and Policy, The International Journal of Knowledge Transfer and Utilization* and *Knowledge: Creation, Diffusion, Utilization.* As stated in his final editorial as editor of Knowledge and Policy journal, William Dunn states 'We have known since the 1920s (Lotka) and later (de Solla Price) that a tiny fraction of research published in peer-reviewed (but also trade) journals reaches other academics. The proportion of research that reaches practitioners and policymakers is even smaller' (Dunn 1992).

Broadly there are two schools of thought about the role of the social science in influencing policy developments (Dunn 1992, Webber 1991/2). The pessimistic or cautionary school of thought is that embodied in the writings of analysts such as Lindblom, and particularly the book *Usable Knowledge,* that influenced a generation of American research in this field (Lindblom and Cohen 1979). Here, social research is an expensive undertaking that plays only a tiny role in policy and other social developments. In this analysis, researchers are frequently guilty of arrogance in holding out research as the only solution to social problems: the authors remind us that many forms of 'ordinary knowledge' are routinely brought to bear on a whole range of complex social problems (Lindblom and Cohen 1979). In addition, 'As Rule (1971) has pointed out trenchantly, many social and educational problems being addressed are there in the first place not because of an absence of knowledge, but because of conflicting interests in the social surround. There are limits, then, to the use of research knowledge in solving social problems' (Huberman and Ben-Peretz 1994).

3.4.2. *A more optimistic approach*
Compared to this rather pessimistic view is a more optimistic school of thought that has produced results that are 'diametrically opposed' to those produced by writers such as Lindblom and Cohen (Dunn 1992: 4). These studies tend to adopt a more holistic view of how social science research knowledge can be used. An important early contribution was made by Caplan in differentiating between 'instrumental utilization' and 'conceptual utilization' (Caplan 1975). This distinction immediately throws up one

of the fundamental differences between the two approaches: rather than simply looking at short-term use of research *information,* the broader approach studies the uptake and transfer of *ideas* in helping to frame debates on policy alternatives. This is a key distinction in the context of the EEA's new responsibilities.

Webber points out that 'pathbreaking research in the knowledge utilization literature has not oversimplified the meaning of 'knowledge use'...' He cites Weiss, a central figure in this field, as saying 'Conceptual use is likely to be more prevalent than instrumental use. It may also be more significant. Instrumental use is often restricted to relatively low-level decisions, where the stakes are small and users' interest relatively unaffected. Conceptual use, which does not involve immediate and direct application of conclusions to decisions, can gradually bring about major shifts in awareness and reorientation of basic perspectives' (Weiss 1981:23).

Webber states that it is too easy to 'focus too narrowly on use (of research) as a behavior attributed to an individual policy-maker, while under-emphasizing the importance of dissemination and diffusion activities over which the policy-maker exerts little control' (ibid.: 9). Research communication activities fit into a systemic process of policy analysis in which many different actors play a part, not simply a small group of 'policy-makers'. This insight offers the possibility of a much greater role for the dissemination of ideas than one that constricts its role simply to connecting individual bits of information with people that can use that information in an instrumental way. He goes on to conclude that studies of knowledge utilization need to 'examine the decision-making context and policy-makers' needs and motivations ... knowledge use is just one part of a variety of policy-making activities' (op. cit.). The term 'knowledge creep' was coined by Weiss to describe the way in which ideas gradually – or in some cases quickly – spread, enter into use, and sometimes become the conceptual framework of entire policy debates.

In the interests of brevity, this report will not elaborate at length the great variety of ways that these analysts and others have identified that research can feed into policy: the authors and sources cited here are commended for this. Implications for research dissemination are the focus of interest, and are discussed next.

3.5. How can research be effectively disseminated?

Assessing the effectiveness of research dissemination takes place within the above context. It is again an area riven by disagreements. Dunn points out that 'Existing theory and research in the field of communications (Rogers), marketing (Zaltmann), bureaucracy (Rich), truth and utility tests (Weiss, Holzner, Dunn), and the economics of information (Machlup) unequivocally show that the mass dissemination of information is costly and ineffective in transferring knowledge ... that can actually help improve policies' (op.cit.).

However, sadly Dunn does not suggest any positive ways forward and does not acknowledge that many other aspects of public policy are also expensive and can seem to have little effect, but that this is not sufficient reason for abandoning them. Perhaps his focus is upon the *mass* element of 'mass dissemination': he does not explain. These observations of the debates in the field of research utilization are made not to argue against the value of research dissemination, as will be shown next, but simply to warn that there is no consensus about it and that therefore any organisation charged with research dissemination would do well to proceed with care and with an eye to the pitfalls.

Clearly, research without communication does not exist: it is a question of establishing what constitutes the style and intensity of effective communication with non-academics. Indeed, writers on the philosophy and sociology of knowledge such as Merton, Kuhn and other more recent writers such as Giddens have shown communication to be central to the scientific enterprise (Kuhn 1974, Giddens 1984, 1987).

The immediate obvious reason for the importance of dissemination is given by Webber: 'Policy knowledge ... is not effective if retained in the hands of the producer. The knowledge utilization literature has made it clear that policy-makers do not generally go about seeking knowledge to assist them in understanding every decision they must make. Policy knowledge must be distributed from the producer to the policy-maker so that it can be used in making policy decisions' (op.cit: 25). As stated by Hicks, 'The assumption that knowledge utilization is advantageous for policy-making is based on the notion that more knowledge facilitates better action' (Hicks 1991/92).

It is perhaps helpful to draw a distinction between *more* knowledge and *better* knowledge. But without wanting to get stuck in semantics, the crucial point to note is that research knowledge 'must be expressed, communicated, channelled, explained or otherwise distributed to policy-makers if it is to affect policy decisions' (Webber, op.cit.25).

3.5.1. Limits of 'linear dissemination'
Even this sort of statement can be seen as controversial. The main criticism is that such statements imply an overly 'linear' view of communication between research and the rest of society: that the 'research community takes a God's eye view of the world, and passes it on' (Huberman and Ben-Peretz 1994: 4). However, 'users' are far from empty vessels waiting to be filled with the wisdom of research' (Huberman 1994: 28). The 'user' community is also not uniform – many different sorts of users seek to use research in different ways and for different purposes. This has been a significant insight that has come out of research on knowledge, assessment, and the policy process both at Harvard University and in the Netherlands at RMNO; these research projects will be discussed further below. While it is instructive to bear in mind that particular pieces of research will need interpretation to be relevant in particular contexts – or may not be at all useful or even counter-productive in the eyes of policy-makers – to dismiss out of hand the value of dissemination is surely to throw the baby out with the bath water?

Some of the criticism of linear communication gets caught up in a slightly different matter. This is the assumption of some researchers that 'a valid study will convince readers to change their minds and acts, whatever the form in which that study is transmitted' (Huberman 1994: 31). As Huberman points out, this assumption is 'hubris' (arrogance). Another fault of linear communication is that it means that 'researchers have construed their audiences as passive 'targets', rather than as people weighing new information against the constructs and experiences they have built up throughout their lives' (ibid.: 31). But neither of these criticisms of linear communication undermines the case for thoughtful communication: in fact they reinforce it.

3.5.2. Interactive styles of research
Certainly, the relevance of research can in some cases be improved by an 'interactive' style of working where researchers and practitioners jointly define and elaborate

research strategies. And this insight has important implications for dissemination strategies and their relationship with the design of research. Huberman calls this 'sustained interactivity' where practitioners' 'frames are activated and coordinated with those of the researchers ... It is a good model of learning ... From that perspective, dissemination becomes less of a chore and more of conceptual stimulant ... It would be a small step from here to the thesis that 'sustained interactivity' is the vehicle of choice for combining the fruits of research with the understanding and skills of professional practitioners' (Huberman 1994: 28).

But interactive styles of research are not the only ones that can be useful in policy development: sometimes the most distant or 'irrelevant' research can be most useful, particularly where policy makers need independent and authoritative research to back proposals. As Huberman reminds us 'It was Lewin, you will recall, who coined the phrase that the best practice was a good theory': Lewin was one of the founders of the research utilization field in the US (Huberman 1994: 16). In these cases, research communication will again be required, either through traditional channels such as peer reviewed journals (a source of policy knowledge that must not be forgotten) or other more targeted channels, which may often involve the digestion and synthesis of research insights.

In summary, we can see the complexity of the issue of dissemination: it is not always simply a 'bolt-on' exercise at the end of a research process, but neither is it always suitable to make it an inherent part of research. So what can we conclude about effective communication in science?

3.6. Effective communication in science

According to some reviewers in this field, the complex process of communication in science has not received much attention in its own right (Lievrouw 1992). Lievrouw argues that most writers on science 'have tended to see communication as an intermediary step on the way to some other phenomenon of interest'. She suggests a three-stage model of science as a communication cycle with three progressive stages: conceptualization, documentation, and popularization.

Conceptualization starts off the communication process, with ideas being formalized or schematized into concepts. Documentation

widens the process and is aimed at reaching a larger audience, usually following stylised rules of scientific communication via academic literature. At the popularization stage, intermediaries or third parties can play an important role. As the cycle progresses, communication structures and strategies become both larger and more complex, with more actors involved.

Lievrouw proposes four initial observations about the characteristics of scientific fields that practice effective dissemination:

1. They have a clear statement of goals.
2. Their members communicate frequently and across greater distances and/or institutional boundaries.
3. Their main 'problem' is broadly anchored – 'that is, it relates clearly to a greater number of other more familiar issues' that are of interest to key audiences.
4. Their members 'manage to popularize their principal issues or findings (via mass media coverage for example)', leading to a 'more eclectic mix of resources and personnel'.

In addition, she states that 'Fields whose members adopt highly specialized, abstract technical language tend to resist entry by outsiders, and therefore, tend to remain 'little sciences'. This tendency is only overcome if member of the field are willing to 'translate' their findings into more accessible language' (op.cit: 26). Immediately from these five key observations, we can see a number of roles beginning to emerge for the EEA with respect to dissemination of environmental research. These roles are discussed further at the end of this paper.

3.7. Harvard studies on the effectiveness of global environmental assessments

These observations are all reinforced by more recent work by Clark and colleagues at the Harvard Global Environmental Assessment project. This project is investigating the practical impact and effectiveness of academic global environmental assessments. The Harvard work is significant in that it is a large-scale investigation, it is broad in its analysis (covering many countries and many different case studies), and it also has a long history: for example, Clark was writing on the issue as early as 1985 (see Clark and Majone 1985). It is worth dwelling on this work since it is probably the most important work being

undertaken globally on this issue.

The Global Environmental Assessment process considers 'assessment' as 'the entire social process by which expert knowledge related to a policy problem is organized, evaluated, integrated, and presented in documents to inform policy or decision-making' (GEA 1997). Assessment, therefore, is a process that bridges expert knowledge and policy and seeks to inform policy-makers – quite similar to the concept of 'research dissemination' as used in this paper. Assessment is looked at as a 'social communication process' linking scientists, decision-makers, and other parties (Clark et al. 1999).

An important part of the work of this international team has been to look at what makes one assessment more effective than another in terms of how well these studies have been communicated to, and taken up by, non-academic decision-makers. They strip their findings down to three characteristics that 'seem to be most important in distinguishing effective assessments': saliency, credibility and legitimacy, defined as follows:

Saliency 'is meant to capture the perceived relevance or value of the assessment to particular [non-academic] groups' who might use it to promote policy change (ibid p.5 my brackets)
Credibility 'is meant to capture the perceived authoritativeness or believability of the technical dimensions of the assessment process to particular constituencies, largely in the scientific community'
Legitimacy 'is meant to capture the perceived fairness and openness of the assessment process to particular constituencies, largely in the political community' (ibid p.5).

The authors go on to note that 'these distinguishing characteristics are little more than formalized common sense. Yet the disturbingly high ratio of ineffective to effective assessments out in the world suggests that formalizing common sense may have some value'. Many assessments are ineffective due to inadequate attention to one or other of these criteria. For example, the authors note that saliency can be undermined by assuming that 'the questions important to the scientific community are the same as those important to the policy community', or because research results are delivered too slowly to be of any use in policy processes that are evolving quickly.

Attention to these and other factors that can render assessments ineffective can provide useful perspectives on what is required to achieve the opposite. However, space does not allow a full rehearsal of these thoughts here, so readers may pursue the references themselves (a useful starting place is the related web site http://environment.harvard.edu/gea).

3.8. Characteristics of effective studies

Fortunately, the authors do go on to discuss the positive factors that characterise effective research studies, which are summarised here. They again note three main headings under which the factors that lead to effectiveness can be grouped:

• historical context
• characteristics of the assessment user or audience, and
• characteristics of the assessment itself.

Historical context relates to the type and amount of attention that has been paid to an issue. Many environmental issues experience an 'issue attention cycle'. The cycle usually starts with the debates being mainly scientific in nature. Some event then leads to the issue having a higher profile in policy or public debates. Clark and colleagues find that assessments are often ineffective at achieving policy change because they produce their policy recommendations too early – that is, before decision-makers are interested or engaged in the debate. Another reason is that when the issue does become high profile, the analysts involved in the issue fail to alter the nature of their analysis, recommendations or style of communication in the light of the expanded set of participants.

The implications here for the EEA seem to include:

• the importance of timing: the most effective point to intervene in an 'issue attention cycle'
• the choice of issues to focus upon: which research to disseminate when
• the need to translate scientific research into accessible forms and/or the need to organise face-to-face meetings between researchers and the non-academics who have become interested in an issue
• and also possibly the need to demonstrate to researchers when an issue has changed from being a purely scientific matter, and how to adapt to these changed circumstances.

Characteristics of the user include the key issues of interest, capacity and openness, according to the Harvard team. We have already noted the crucial importance of users being interested in the results of research if they are to find an assessment useful: this can present a formidable blockage at the wrong moment in the issue attention cycle, as 'they have too many other things on their plates' (ibid: 7). Clark and colleagues 'suspect that the most effective assessment processes devote a substantial amount of time and energy to negotiating with potential users the particular questions about which those users are most passionately and urgently interested'. The difficulty here, even if such an intensive consultation process does take place, is in producing research results fast enough to be able to feed into policy debates. However, it does suggest a more 'interactive' style of research and research dissemination that the EEA could both be an advocate for and also help to organise.

The *capacity* of users is the second characteristic picked out as important for effective engagement in assessment work. Clark and colleagues point out that civic groups, policy communities and even entire countries can lack capacity and therefore involvement in a field of study, leading to a sense of alienation from the policy prescriptions and possibly from the policy process as a whole. The implications for the EEA here are not entirely clear given its limited ability to create such capacity, except that it could expand the network of non-academic groups that engage in the policy implications of research findings. By demonstrating the relevance of research to policy, it could ultimately encourage some policy organisations to decide to devote more capacity to the task of engaging with the research community.

The characteristic of *openness* is, by their own admission, a somewhat vague and tentative finding of the Harvard team's work. They seem to be saying that any effort that increases the amount of communication and analysis of environmental issues can only ultimately be helpful. Although multiple analyses and voices may lead to some disagreements along the way, as research findings converge this is likely to lead to greater confidence in the results, and therefore a great willingness among decision makers to take action on the environmental issue at hand. The EEA can be one more channel of communication that can add its voice to existing debates or use its position to open up new ones.

Characteristics of the assessment The third and final set of factors that determine the saliency, credibility and legitimacy of assessments are the characteristics of the assessments themselves. Again, three main headings emerge from the Harvard work:

- how the science/policy interface is structured
- how participation in the assessment process is determined, and
- how uncertainty and dissent are handled in the assessment report.

The paper cited gives an interesting but lengthy discussion of these issues; the following paragraphs draw out a summary of what seem to be the main points of relevance to the EEA.

The main point to note is that analysts seem to agree that the line between science and policy is one that shifts over time, especially where issues are characterised by high levels of complexity and uncertainty, as with many environmental problems. This boundary is itself constructed around a 'fundamental tension of scientific assessment in the policy arena – maintaining scientific credibility (by not politicizing research) while assuring political saliency (by producing information that is relevant and useful to decision makers)' (ibid:9).

This leads to what is, for the EEA, probably the most important observation from this work. It is that the work of handling this tension can often be assisted by the creation of *boundary organisations* that have a foot in both camps (science and policy). They perform tasks that are useful to both sides, and involve people from both communities in their work, but play a distinctive role that would be difficult or impossible for organisations in either community to play. This is exactly the gap that the EEA can now fill in disseminating environmental research. The next section is so significant for the EEA that it is reproduced here in full:

'The literature on boundary organizations suggests that they can provide an array of important functions. Among other things, they can: 1) 'translate' scientific information from scientists to policy-makers; 2) communicate research needs from policy-makers to scientists; 3) protect scientists on one side of the boundary from accusations of bias or illegitimacy, while protecting policy-makers on the other side from (accusations of) technocratic intrusions; 4) provide neutral

forums for debate; and 5) create a site for building long-term trust between the policy and scientific community. In providing these services, the organization's boundaries are selectively porous, allowing some but not all information, people, or ideas to move across. The professionals in a boundary organization are primarily responsible for determining what can cross the boundary, when, and in what way, through a process of negotiation with scientists and policy makers that is dynamic and potentially contentious. In order to limit the potential for conflict, the standardization of this process may be an important goal for boundary organizations' (ibid:10).

The second issue – that of participation – has been covered briefly elsewhere, but the third issue – of uncertainty and dissent – have not, and are of growing importance, at least in UK debates of environmental policy. Indeed, highlighting the central status of scientific uncertainty in public debates and policy around the issue of GM food was one of the contributions made by a piece of research dissemination undertaken by the Global Environmental Change Programme, as is outlined later. The issue to note here, as Clark and colleagues so rightly point out, is that the political demands for certainty from scientific assessments can lead to the suppression of dissent and to an unwillingness to acknowledge the degree to which different but equally valid assessments can propose a wide range of possible outcomes. That these different findings can be equally valid is a simple function of the complexity

and uncertainty of the issues under scrutiny. In many cases, it is simply not possible to provide definitive answers about the 'best' way forward for policy: 'best' will need to be decided on the basis of different people's assessments of the trade-offs to be made between potential benefits and hazards, and these in turn rely on the values, cultures and interests of the different groups involved.

In these circumstances, a boundary organisation such as the EEA will need to be responsible in highlighting and explaining any uncertainty and dissent attached to any research it is disseminating. Indeed, it should ideally go further: it should recommend ways for policy to handle this uncertainty and dissent, since to ignore them is to ask for trouble, while to face up to them, although difficult, will ultimately lead to a more complete and ultimately more effective policy approach.

The work by Clark and others is summarised in the diagram below.

3.9. A synthesis of other key insights

Other analysts have added their evidence to discussions about maximising the benefits from public research. This section gives a brief review of the most useful contributions that the author has been able to find. Many of these echo the above discussion: they are added here simply to indicate the degree of consensus emerging in the literature and thereby to strengthen our confidence in the insights.

Elements of a conceptual framework for thinking about effective assessments

From Clark et al. *1999*
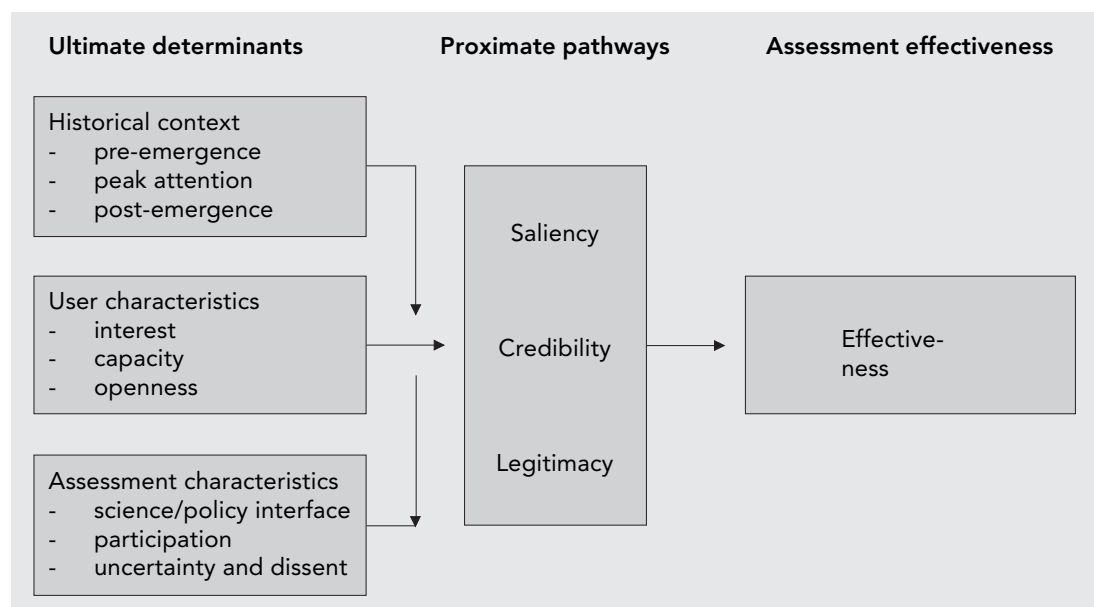
A research project conducted by RMNO (Advisory Council for Research on Nature and the Environment) in the Netherlands has examined four case studies on the use of environmental knowledge in public policy. The report of this project is summarized in Box 1.

Faulkner concludes that in order to improve the knowledge flows from public sector research, 'policy should be geared to increasing the number of communication channels … rather than the number of formal linkages ... Because of the 'bitty' and coalescing nature of knowledge use in innovation, much of the contribution of public sector research is not plannable at the micro level; all one can hope to do is to set up structures and cultures for this to happen. We have suggested that 'dating agencies' provide a better model (of linkage) than 'marriage brokerage'!' (Faulkner 1995:3).

Brown highlights three conditions for useful interaction between researchers and practitioners or policy makers: clear presentation of research material, a sense of ownership among practitioners of the results of research; and the need for a suitable forum for communication (Brown 1992).

Janet and Carol Weiss summarise their findings as follows: 'Research is used when the topic is relevant, when it deals with an issue administrators can do something about, when it can be built into pending decisions, and when it is understandably written. Sometimes, four variables can get you far' (Weiss and Weiss 1981 in Huberman 1994:21).

Huberman, in his useful 'State of the Art' review of the literature on research utilization, argues strongly that a limited number of key variables of effective research dissemination can be identified that encapsulate most of the issues involved (ibid.). These build on findings from a large number of studies and come under the general titles of: research context; user context; linkage

---

Box 1: 'Willingly and knowingly': Environmental knowledge in policy processes

The work of RMNO (Advisory Council for Research on Nature and the Environment) in The Netherlands provides another source of experience about using research and knowledge in making environmental policy. A two-year effort, incorporating studies, workshops, and discussions, examined four case studies of national policy efforts that made use of knowledge of the environment and nature. The results were published as a volume in June 2000, entitled 'Willingly and knowingly: The roles of knowledge about nature and the environment in policy processes.' The four cases examined were: discussion about the construction of a fifth runway at Schiphol airport; plans to build 20,000 houses at the location Leidsche Rijn; measures to limit the production of manure in agriculture; and proposals for a railway connection between Rotterdam port and the hinterland.

From these cases, the authors draw several conclusions about the roles that environmental knowledge plays in public policy forums. One of their key areas of insight relates to the types of knowledge that were seen as pertinent and that were allowed to emerge in the policy debate. They note that policy problems tend to be defined selectively, and therefore knowledge about them is most often developed within that framework. Therefore, the types of knowledge that may emerge into discussions are limited by this problem definition. Certain 'taboos' tend to exist in public policy discussions – topics that are excluded from consideration – and knowledge about these issues is excluded as well. For example, in their case study of manure, the authors note that the policy option of shrinking of livestock numbers was a 'taboo' subject in dealing with the manure problem. Knowledge does not get accounted for in defining public policy problems, but only in responding to an existing framing of the problem. What knowledge is put to use is largely technical, and tends to serve powerful socioeconomic interests.

On the research side, the selective use of environmental knowledge has significant effects as well. The authors find that research can be just as divided and resistant to new information as decision making. Many participants in public policy issues assume that research will provide the 'truth,' whereas this is hardly a good approximation of reality, a conclusion that philosophers of science reached long ago. The fragmentation of research and polarization of perspectives within the research community often means that research increases uncertainty. Knowledge itself is often static and report-oriented, and not interactive or interdisciplinary.

Beyond a mapping of the characteristics of the research-policy interface, the authors provide a number of general recommendations and 'perspectives for action.' They recommend strategies such as integrated problem analysis, interdisciplinarity, open decision-making processes, and iterative communication between knowledge-producers and policy-makers. It is also suggested that the existence of an intermediary or interpreter between policy and science may be desirable, a role similar to that envisioned for the European Environment Agency in facilitating research dissemination. Such a facilitator would assist research and policy actors in reaching what the authors term, in contrast to the objective 'truth' often expected from knowledge providers, a 'shared truth' – a negotiated knowledge usable for policy decisions.

Source: R.J. in 't Veld, ed. 2000. 'Willingly and knowingly: The roles of knowledge about nature and the environment in policy processes.' RMNO (Advisory Council for Research on Spatial Planning, Nature, and the Environment); Rijswick, Netherlands, June 2000. Lemma Publishers: Utrecht.

mechanisms, predictors of local use; and dissemination effort. These are all brought together in a 'dissemination effort model' that can act as a framework that can be used to define the most relevant variables in a particular instance (see figure 1).

Huberman recognises that this model appears linear and mechanistic but in its defence 'it does have the merit of putting in one place those variables that have been shown in several studies – and in very diverse configurations – to affect the use of research findings' (ibid.: 21).

The model can inform the EEA's deliberations in clear ways: the Agency could become a key 'intermediary' (see linkage mechanisms) and can intervene helpfully in many ways in the 'dissemination effort' column by providing communication channels, follow-through and continuity, assistance in the quality of written products and many others. The only criticism of the model from our point of view might be that it is concerned primarily with dissemination from single research projects or teams, whereas the Agency's remit reaches across projects, countries and topics. It is the potential for a creative synthesising role that is missing from the model that might form a central part of the Agency's effort in this field.

3.10. Assessing the impact of publicly funded research

There is a large literature on research evaluation, including the evaluation of the impact of research. This literature will not be

---

Figure 1 | **Dissemination effort model**
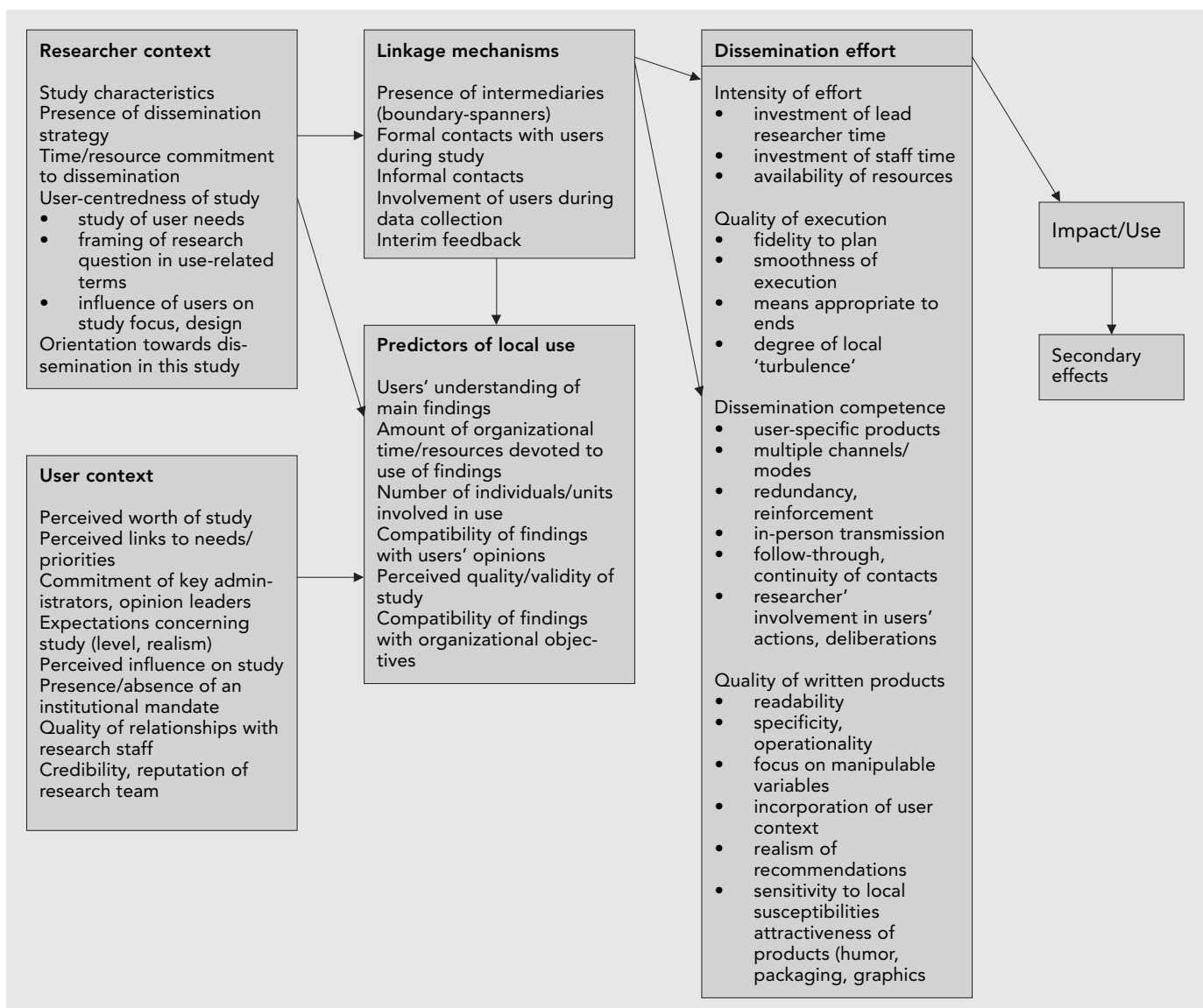
explored here, except to note that Kostoff, in his *Handbook of Research Impact Assessment* has given an extremely thorough review of the issues, methods and literature (Kostoff 1997). In brief, he shows that there are broadly three main approaches to research impact assessment: retrospective, qualitative and quantitative, each with their own strengths and weaknesses.

Measuring the impact of public sector research is difficult given the indirect and often intangible nature of many knowledge flows, particularly in the social sciences. Faulkner points out that the social sciences offer insights on an even wider range of socially and policy relevant topics than natural science, and have more potential audiences with which to engage. Determining the effects of research among all of the other influences on the development of policy and practice in such a wide range of organisations and situations is 'a nearly impossible task' (Huberman 1994: 21). Indeed, to follow the path of the influence of each email message, publication, personal contact and all the other myriad communications emanating from a research initiative

such as the Global Environmental Change Programme, discussed in the next section, is probably impossible under the laws of thermodynamics!

Faulkner is again thoughtful on this subject. She suggests studying dissemination measures as a proxy for impact, although we run into problems of quantity vs. quality. Asking both the research producers of information and users for their views on communication and its effectiveness can provide an element of triangulation absent from relying on one side alone. But getting at the informal and diffuse effects of research dissemination is going to be very difficult and will sometimes have to be treated anecdotally. Barker's review asserts that an effective evaluation of a linked programme of research should involve surveys to achieve a breadth of vision and case studies to achieve depth for particular case studies (Barker 1994, Barker and Georghiou 1992).

This section has given a very brief review of key sources and issues in assessing the impact of dissemination. Once again we are touching on a difficult and controversial area.

4. Dissemination in the UK Global Environmental Change Programme

The Global Environmental Change Programme of the UK Economic and Social Research Council has been one of the largest environmental research undertakings in the UK during the 1990s. Research dissemination has formed a central part of efforts to ensure 'added value' from the programme.

4.1. Background to the programme

In the early 1990s, UK research into global environmental problems was dominated by the natural sciences. Yet, as discussed above, environmental problems have human origins, have impacts on society and must be solved or mitigated by human actions. Natural science research on environmental change therefore needed to be complemented by social science research. One aim of the programme when it was established in 1991 was therefore 'to take the social sciences to the heart of debates about global environmental change'.

However, few social scientists were at that time addressing the issues, so the other aim of the programme was 'to take environmental issues to the heart of the social sciences'. Dissemination within the programme has therefore been aimed at achieving more than just the communication of research results. It has been about promoting the value of social science perspectives in analysing environmental issues *and* about promoting environmental issues as serious topics for analysis within the social sciences. At the end of the 1990s, it can be said that both of these aims have been at least partially achieved in the UK.

The Economic and Social Research Council (ESRC) initiates research programmes in priority areas that it considers need addressing in a substantial way. The intention is that by funding a series of projects coordinated by a Programme Director, it will be possible to 'add value' to each of the constituent parts. This added value is created by bringing the researchers together and by combining publicity and dissemination efforts.

The Global Environmental Change Programme has been the largest ESRC programme during the 1990s, involving around 150 research projects, fellowships and studentships and an expenditure of about

£15m. All ESRC programmes are coordinated by a director, a senior academic with experience in the subject of the programme concerned. Due to the size of the Global Environmental Change Programme, it not only has a director but also an assistant director (the author of this paper) and a programme administrator.

In the final year of the programme this changed due to the departure of former director Jim Skea. A new team involving a larger number of people focused almost entirely on dissemination as the main task for the final year, and included a collaboration with the electronic research dissemination unit ID21. Some of the methods adopted through the programme's life will be discussed next.

4.2. Research dissemination: principles and tools

This paper now reviews the various research dissemination measures that have been adopted within the Global Environmental Change Programme. These have co-evolved with a set of research dissemination principles. These are elaborated later.

Dissemination of the programme's research is aimed at a wide range of research users including central and local government, agencies, business, non-governmental organisations, international organisations, the media and the wider public. In order to reach these very different audiences, the research dissemination strategy has employed a selection of dissemination tools. These measures include:

- broad scale, Programme-level awareness-raising activities
- dissemination of findings from specific research projects
- topic-driven dissemination that synthesises the findings of several projects
- investigation of the needs and interests of key research 'users'
- targeted dissemination to these audiences
- dissemination in response to particular opportunities, such as government consultations
- experiments with 'interactive' styles of research.

4.2.1. Awareness-raising activities

These started at an early stage of the programme's life, with the establishment of a programme newsletter and publicity for the programme through various channels including conferences and other media.

The aims of these awareness-raising activities have been to let people know of the existence of the programme; to encourage their participation by providing specific information on research and events of interest; and to acknowledge the support of the ESRC. More broadly, the aim is also to highlight to the programme's various audiences the contribution that social science research can make in addressing environmental issues.

The newsletter 'Gecko' has been produced three times each year and is a communication tool for reaching audiences both internal and external to the programme. A contacts database has therefore been developed in order to ensure that information about the programme reaches key audiences. The contacts database includes not only researchers within the programme but also key people from six main audiences: research, business, media, policymakers, politics, and research management. This contacts database now runs to over 4000 key contacts in the environment-research-policy-practice nexus.

Awareness-raising activities have also included the production of a range of information materials for user and academic audiences. These include an information pack and a comprehensive web site (www.gecko.ac.uk). These are based around a directory of the programme's research, and information on publications and events at both the programme and project level. This information pack has been used both passively – in response to enquiries – and actively, when the programme office has sent it out to key audiences.

An email news group also complements the newsletter, in that it is used to give information on events, jobs and publications that would not be included in the newsletter either because of lack of space or because of the short deadlines involved. Anyone can join the email group, which now has over 400 members.

4.2.2. Dissemination of findings from specific projects

This is achieved in several ways. Research briefings – accessible four page summaries of research findings – are the main method used to disseminate the results from individual research projects. The first draft of these is produced by the researchers who undertook the research. Professional science writers then edit the draft. The aim is to make the briefings engaging for a broad 'intelligent lay' audience – that is, readers who are interested in the issue but not necessarily familiar with technical jargon, research methodology or the latest thinking on a particular topic. Briefings are sent out with the newsletter at the rate of eight per year.

In addition, each research team or fellow is asked to produce a one-page summary of their research plans at the beginning of their project. These one-page summaries are updated at the end of research projects to take account of the research findings. Again, these were co-edited for clarity and in order to assure a similar format was used throughout. These summaries are sent out in response to enquiries ('what research have you got on…?'), in combination with briefings. They also form the basis for a page on each project on the programme's website. Given that there have been 150 projects within the programme, just keeping these summaries up to date has been a substantial task in itself.

4.2.3. Topic-driven dissemination

Topic-driven dissemination that synthesises the findings of several projects has included several initiatives. The main one is a series of Special Briefings. Unlike the Briefings, which report on the results of single research projects, Special Briefings bring together several research projects to shed light on a topic of particular policy interest. They seek to do this by focusing around a series of questions that non-academics might ask of research.

The first Special Briefing was produced at the time of the Kyoto conference on climate change in 1997. It examined the feasibility of reaching the UK's targets for greenhouse gas reduction. This had considerable policy and media impact, with some of the researchers who had contributed being interviewed on high profile news and current affairs programmes and being invited to policy development meetings.

The second Special Briefing brought together the results of four projects on environmental education around the issue of how to make environmental education more effective. Again, this document has had

considerable impact in both research and policy communities. Contributors to this document have been involved in national policy developments, conferences and advisory committees, such as the UK Government's committee on Education for Sustainable Development initiated jointly by the Secretary of State for Education and Employment and the Deputy Prime Minister in his capacity as Secretary of State for Environment, Transport and the Regions.

The third Special Briefing synthesised a range of research insights around the issue of sustainable development. The document was based on the Global Environmental Change Programme's submission to the UK government's consultation in 1997 on its new sustainable development strategy, which was eventually published in 1999. Again the document has been a useful way of synthesising the programme's findings and has been cited by senior Government officials as a particularly significant contribution to the Government's consultation.

The fourth Special Briefing reported the findings of a meeting which considered the issue of 'interactive' research: research that is specifically designed and executed in a way designed to answer the needs of non-academic decision makers. Although there was unanimity about the great demand for this style of research, it was also agreed that current research funding systems do not encourage or adequately support interactive research.

The fifth Special Briefing, published in October 1999, was possibly the most controversial and influential document to emerge from the Global Environmental Change programme. Entitled 'The Politics of GM Food: Risk, science and public trust', it sought to answer why GM food had caused such political difficulties and how to move forward. It dwelled on issues of risk and uncertainty, explaining that the public were not as ignorant about these matters as is sometimes assumed in official circles, and showing that the current system of regulating GM foods was too narrowly conceived to address all of the issues of concern to the public. This in turn was leading to an erosion of trust in official statements.

The document received blanket coverage in the media and caused a degree of controversy, not least in policy circles. But it ultimately led to a fruitful meeting between five of the researchers involved in the document

and Dr Mo Mowlam, the Government Minister for the Cabinet Office, who is responsible for overall coordination of UK Government GM food policy. UK Government policy on GM food has since been seen to shift substantially in the direction of our recommendations. A fuller account of the events around the launch of this document is currently under review for academic publication – please contact the author if interested.

4.2.4. Investigation of the needs of key research 'users'

This has included a series of face-to-face interviews; monitoring of the policy agenda; and on-going dialogue through personal contact.

In 1994, two short consultancy contracts were used to assess and enhance interactions between GECP research and a) policy-makers and b) decision-makers in business. The aims were: to assess the degree to which these key people were aware of the programme's research; to identify topics of interest both in the current research portfolio and for future; and to propose suitable methods for encouraging interaction between research, policy and practice.

A number of insights emerged. First, the 'policy' community was a lot easier to identify and contact than the business community. This may have been to do with the way that the work was executed: the two consultancy contracts were let separately to different organisations. The consultants that executed the work with policy makers concentrated their efforts on a relatively small group of officials in central government departments whereas the business consultants wanted to do a broader assessment. From the results, the business community appeared to be more diffuse and heterogeneous in terms of its interests in environmental issues. This partly depends, of course, on one's definition of the 'policy' community: in a world of 'stakeholders', policy is developed and legitimised by a large group of different institutions with varied levels of influence and widely different interests.

The second finding to emerge relates to the expectations that these non-academic groups hold of publicly funded research. A series of topics of interest were identified. But it also emerged that practitioners are often more interested in contact with researchers or research teams than in particular pieces of research. They want understanding as well as facts, and they need knowledgeable people

with whom they can interact. This has been reflected over time in the wide range of advisory positions that have been fulfilled by programme researchers and staff. For example, Parliamentary select committees have appointed all of the following (and probably others) as special advisors on a range of different topics: Jim Skea, Judith Petts, Paul Ekins, Brian Wynne, and the author.

Non-academics also want tools to guide decisions. 'Useful' researchers are both undertaking relevant work *and* understand how policy is made. This includes an appreciation on the part of researchers that while research may be based in disciplines, research users and policy decisions never are. Finally, officials are keen to ensure the academic rigour and respectability of the research that they are going to employ.

The above gives a short summary of the main findings of the consultancies. But it is also important to learn lessons about the value of the consultancies themselves, particularly if the European Environment Agency is to undertake a similar exercise itself. These points are covered in the final section of the report.

Identifying the needs of research users has subsequently been achieved by monitoring the policy agenda and through personal contacts. The programme office has tried to maintain an awareness of Government consultations, parliamentary inquiries and broader policy developments. This has been achieved through scanning information sources such as key periodicals, getting the programme office into information networks such as those set up by Parliamentary Select Committee Clerks, and through personal contacts of those in the programme office and the programme's researchers.

As a result of the above monitoring activities, the programme office has then designed packages of targeted dissemination to key audiences, discussed next.

4.2.5. Targeted communication: evidence for policy
The programme office has submitted evidence-based responses to a large number of government consultations, parliamentary inquiries and other policy development initiatives, including:

- Government policy consultations on sustainable development, SD indicators, climate change, renewable energy

- the Treasury-initiated inquiry into the Industrial Use of Energy (that has led to the introduction of an energy tax on business from March 2001)
- various investigations of the Royal Commission on Environmental Pollution
- submissions to inquiries being under taken by Parliamentary Select Committees in both the House of Commons and House of Lords. One of these resulted in the two researchers from the programme and the author being called to give oral evidence on the issue of how to change people's behaviour to help mitigate climate change.

These documents and others are all posted onto the programme website to encourage wider distribution. The email news group is informed of updates and additions to the web site.

4.2.6. Targeted communication: bringing people together
Face-to-face meetings have been an important means of dissemination. Some of these have been organised in collaboration with user institutions. These have included collaborative events with the following organisations: the UK Environment Agency; OECD Environment Directorate; East Sussex County Council; the Foresight Programme of the Office of Science and Technology; the Scottish Office and a range of others.

A host of topic-driven meetings have also been organised, frequently involving the participation of key relevant non-academics according to the topic. This has been encouraged by supporting researchers to do their own networking and dissemination work with financial assistance from a networking and dissemination fund of £75,000 per year. This has supported a wide range of events covering issues as varied as Environmental Education, a network of researchers interested in Business and the Environment, a Financial Sector Environmental Forum involving both researchers and practitioners, a national network on Sustainable Cities research and policy, a practically-oriented network on Green Supply Chains, and more.

4.3. Broader dissemination issues

So far, this section has concentrated on the programme's attempts at research dissemination. Most of these work on a linear model of dissemination that assumes that research produces findings of interest to particular

audiences, and that these findings then need to be communicated to the audiences. But as we have seen this linear model of research-policy communication has been criticised as insufficient to produce the maximum benefits for all parties. Communication between research and policy is characterised not just by one-way flows of information but there can also be a useful two-way dialogue. We have therefore acknowledged that one-way communication of insights is a necessary but not sufficient condition for maximum benefits to be derived from research: there are other ways to achieve this.

Some of the most helpful research involves users from the outset in identifying issues and in executing or managing the research. This style of research has been termed 'interactive', and there have been various experiments with interactive styles of research within the Global Environmental Change programme. Interactive research projects were encouraged by offering 'starter grants' – small grants that gave researchers the opportunity to explore collaborations with practitioners and policy-makers and also across disciplines. Fourteen starter grants were awarded, and six full projects resulted. All of the researchers involved – including those not successful in realising a full project – found the starter grants useful. Many of the full grants resulted in innovative interactive collaborations with research users via co-funding and research cooperation.

4.4. Dissemination in the programme's final year

Dissemination was the focus of the work of the programme office in the final 15 months of the programme (April 1999 – June 2000). This section briefly describes some of the measures adopted, since there were some significant differences of emphasis from previous dissemination work in the light of the finite period now left until the end of the programme.

Our aim was to bring together the main thematic findings from the programme's research, so in consultation with a group of advisors drawn from across academia, the worlds of policy and business, and from civic groups, we developed three themes around which to 'cluster' our messages:

A. Risky choices, soft disasters? Environmental decision-making under uncertainty

B. Who governs the global environment?
C. Producing greener, consuming smarter?

Each theme was developed in a 'Programme Summary' document that summarised the main academic debates about the issues, and sought to answer a series of 'ordinary questions' that non-academics might want to ask about those issues. The documents, which are available at www.gecko.ac.uk, were produced in advance of the programme's final conference and formed the basis for discussions at that meeting.

4.5. Using the media

The publication of each document was taken as an opportunity to generate media coverage of our work. The Special Briefing on 'The Politics of GM Food', already discussed, was our first major media 'hit' during the final year. This document brought together research by ten GECP researchers. Some of this research had been in the public domain for several years. Until that time, however, we had largely failed to generate serious policy attention for these research findings, mainly because some of our conclusions were somewhat at odds with official policy on GM food. By using the media to project our findings – and generate a fair amount of controversy on the way – we were able to assure some serious attention was paid to our work from official circles. This culminated in a meeting with the Government Minister responsible for overall coordination of GM food policy and, soon after that, a substantial shift in government policy in the direction of our recommendations (although we should be cautious about claiming 'cause and effect' given the large number of other players involved in the GM debate).

We achieved a number of other high profile media successes during the year. The launch of the three Programme Summary documents took place in the House of Commons, hosted by the Environmental Audit Select Committee, and at the launch we focused on the role of innovation in addressing environmental problems. This story achieved some media coverage, mostly in more specialist outlets rather than in the 'news': journalists indicated that although it was interesting, it didn't quite have the edge needed to make it into a news story.

The final conference was a media success, with substantial stories on two of the most influential BBC radio news programmes –

The Today Programme and The World Tonight as well as other media.

Finally, we achieved substantial global media coverage for one piece of the GECP's research over the Easter 2000 weekend, Dr Chris Williams's research on how people's intelligence is being damaged by human-created environmental factors such as radiation, chemicals and the absence of micro-nutrients in green revolution crops. This story started with a piece in the Sunday Independent and on the BBC online news service, and was picked up, mainly from the web-based story, during the rest of the week both in the UK but also in Japan, Chile, the US, and Canada. Details of all these stories are on the GECP website at www.gecko.ac.uk. This story has already resulted in Dr Williams being invited to give key speeches at international meetings and to advise various organisations about this 'new' environmental problem that has actually been around in various forms for centuries but about which there is a curious reluctance to act.

Another useful media 'trick' is to publish unusual or dramatic findings in a high profile scientific journal. Although the peer review process involved may lead to slower publication, this strategy has many advantages including the generation of significant policy and media attention:

- it brings scientific credibility to the findings through processes of peer review
- it takes the story direct to an important target audience – the scientific community itself
- it helps to progress the careers of the researchers involved
- it gives access to the substantial media resources that some of these journals have.

At the time of writing, more media work is planned for the final months of the programme. What we have learned is that the media is a key tool for achieving direct research dissemination to the public but it is also useful for forcing reluctant official bodies to pay attention to research findings that can sometimes bring difficult problems. Media work brings many hazards and resource commitments, but it can also greatly enhance the influence and accountability of the research enterprise. There are various guides to using the media: White et al. (1993) is used here, although this is now too old to take account of the possibilities offered by the internet. Another reference on environment and the media is Smith, ed. (2000).

4.6. Principles of research dissemination

Experiences with the dissemination of environmental research within the Global Environmental Change Programme have confirmed a set of key principles around which such efforts should be based. Research communication is an inherently complex and potentially unlimited task. The subject matter is often highly technical and the key audiences are usually very busy people with little time to engage with research. The obligation is therefore on researchers and research organisations to make it easy for research users to take note of research findings and, more generally, to engage in the process of producing these findings.

The following set of key dissemination principles has therefore co-evolved with attempts at research dissemination within the Global Environmental Change Programme. These have been confirmed by conversations with non-academic users of the programme's research and also by writers on science communication (see O'Connor 1991, Woodford 1967), but they are not a fixed set of principles and can almost certainly be improved.

- look at the subject from the audience's perspective, not the researcher's
- assume that most readers are not specialists in the area
- identify the key messages
- concentrate on these messages
- don't be afraid to repeat them
- keep documents short for rapid reading and repetition
- ensure the use of clear language: explain or replace all technical terminology; write in the active tense; use short, accessible sentences
- ensure the use of good English/ language
- make the most of each 'product'
- be opportunistic, particularly with the media
- emphasise appropriate messages for different audiences

5. European environmental research

This section outlines current European environmental research and its dissemination. First, the emergence of environmental research in Europe is briefly discussed. Next, the current portfolio of research is described. Finally, the dissemination of this research is analysed.

5.1. The emergence of environmental research in Europe

Environmental research within the European Union is a relatively new undertaking (see box). This is especially true of environmental social science. At the level of both the Commission and in many member states, environmental research is still an emerging field.

It is important to acknowledge this simple point if we are to put in perspective both the scale of research undertaken so far and the efforts that have been made to disseminate that research. New research areas take time to become established: research and management capabilities need to be formed, and networks of researchers and stakeholders can take years to build up.

Natural science research on the environment plays a central role in giving information about the state of the environment. This was recognised in the European Community from 1973 and a large amount of natural science research has since been, and continues to be, supported by the European Commission. However, it has increasingly been recognised that social science research can play a useful role in helping to understand the social origins of environmental problems, the human implications of the impacts of environmental change and adaptation to it. Vitally, environmental social science can also play a central part in the design of key policy changes aimed at bringing about sustainable development.

These points are recognised by European research managers. As stated by Liberatore and Sors, 'Understanding the fundamental interrelations between human beings and the environment – the core of sustainable development research – is a relatively novel research task. Both at the national and international levels, research on the environment was initially approached as an exclusive domain of physical and biological sciences or ecology. In the late eighties and early nineties, so-called 'human dimensions' or 'socio-economic environmental research' started gaining some interest and support' (Liberatore and Sors 1997).

As a result of the growing recognition of the socio-economic dimension of environmental change, the Third, Fourth and Fifth Framework Programmes have all included a significant component of socio-economic environmental research. FP3 included the Socio-Economic Environmental Research (SEER) programme, while FP4 included the Human Dimensions of Environmental Change programme, some of which is still on-going.

The Fifth Framework Programme is in the process of being initiated as this report goes to press, but both environment and social science seem to be important components in the design of this new wave of research. FP5 has a greater emphasis on multidisciplinary, problem-solving approaches, and also a focus on efforts to make research results available quickly to stakeholders and beneficiaries.

However, as well as the Framework Programmes of DG Research, environmental research of relevance to sustainable development policy is being supported by a wide range of other organisations, including:

Box 2: The growth of European environmental RTD

1972: The Heads of State and Government of the Member States commit the Community to action on the environment

1973: The European Community sets up RTD Programmes to promote understanding and protection of the environment

1987: With the entry into force of the Single European Act, the European Commission acquires full competence in matters of environment and research

1989: The European Community implements the STEP (Science and TEcnhology for Environmental Protection) and EPOCH (European Programme on Climatology and Natural Hazards Programmes), mobilising almost 50% of Europe's environmental research potential. These were followed by the Environment Programme (1991-94).

From "The Environment - at the heart of European RTD" (European Commission 1994:6)

- other directorates of the Commission, particularly DG Environment and the Forward Studies Unit
- other agencies of the Commission such as the Joint Research Centre Environment Institute and the Institute for Prospective Technology Studies (IPTS)
- Government departments and other public organisations in the member states
- other European organisations including private and voluntary bodies
- organisations outside Europe.

This report is not the place for an exhaustive, detailed description of all of the environmental research taking place in Europe, or even just that supported by the European Commission. In any case, this is already done to some extent by a number of documents available freely on the web and elsewhere. For DG Research, see particularly Cordis Focus 118, September 1998. However, any attempt to assist in the dissemination of research will require an in-depth knowledge of the research. This represents a serious challenge in itself: it is discussed later in this report.

This section has briefly outlined the emergence of European environmental research and the main organisations currently supporting it. The key points to note are that a) the field is relatively new, particularly on the human dimensions of environmental change b) the emergence of environmental research has coincided with a growing emphasis on the dissemination of research results, and c) relevant research is being conducted in an array of organisations.

5.2. Current dissemination of European environmental research

This section is based on an analysis of the dissemination of current European environmental research. First, documents aimed at the dissemination of European environmental research were collected and studied. These included the websites of the relevant Commission directorates and agencies already mentioned. Secondly, interviews were conducted with

- staff members at various European Commission research organisations including DG Research, the Joint Research Centre, Environment Institute, and the Institute for Prospective Technology Studies

- researchers working on research projects funded by the Commission, and
- various other key people involved in producing, using or disseminating environmental research at the European level.

A total of fifteen interviews were undertaken: many more would have been desirable in order to reach a fuller picture of the subject, but time did not allow this.

Several clear themes emerge from this research. Dissemination is growing in importance for all of the organisations and individuals contacted. Many are already heavily involved in networks of researchers and non-academics and talked fluently about the many means available to them to achieve dissemination. There is strong recognition not only of a sense of obligation to make the results of the research known but also that interaction with key stakeholders can bring benefits to the research process. Research utilization for wide social purposes is central to FP5: people talk of this being a point of no return in terms of the way in which research is conceived and organised. Most also recognised the essential role that dissemination can play in avoiding duplication of effort. But until recently, dissemination has not been a high priority and where it has occurred it has been done in a largely passive or automatic way. And a variety of suggestions were made as to how the EEA might assist in the dissemination of research.

These are the general conclusions: specific conclusions and suggestions are elaborated below in the discussion of the Agency's new role.

5.2.1. Current dissemination of environmental research: active

This section gives a brief review of some recent initiatives to actively disseminate European environmental research. Research is being disseminated in both active and passive ways, and some of the research is itself focusing on ways of connecting research to policy processes and a range of stakeholders.

The Commission's research directorate, DG Research, is making increasing efforts to disseminate environmental research. For example, it sponsored a series of workshops aimed at bridging the gap between climate change research and key policy audiences around the time of the Kyoto conference

and beyond. This was based on the idea that 'While research is only one of the factors shaping climate policies and the related international negotiations, linking research and policy is very important due to the complexity of the climate change issue and the high economic, political and social stakes involved' (European Commission, DGXII, 1998b). These workshops involved a collaboration between the Commission's Forward Studies Unit, DG Environment, DG Research and also members of the Commission's Interservice Group on Climate Change. The workshops were 'characterised by exchange between users and providers of scientific information to analyse policy relevant questions in a focused way…'(p.2).

This series of workshops, which aimed at the policy-research interface, was extended in 1998 with a workshop focused on the interface between policy-makers and stakeholders. In setting up this meeting, again the Commission recognised that it needs 'all possible knowledge to be able to identify the opportunities for positive action and coordination. This knowledge does not come only from technical laboratories and the universities. It includes also the variety of insights and information coming from the social actors' (European Commission 1998c).

5.2.2. Research about the research-policy interface

Interestingly, some of the research funded by DG Research is itself focusing on the issue of how to link environmental research to policy-making better.

In the report on the stakeholder workshop mentioned above, the workshop was itself seen as a process aimed at 'producing a distinct type of socio-economic knowledge directly emerging from social partners/stakeholders, their representations and their actions. This knowledge is complementary to expert technical, economic and political knowledge such as that on which the previous policy/research workshops have been mainly focused' (European Commission DGXII 1998c:3). This mode of knowledge creation is again reflected in the recommendations arising from the workshop.

Some projects have adopted a deeply collaborative approach with a range of European bodies, for example on the precautionary principle. Interactions at the research-policy interface have been central to the generation of the knowledge emerging from such work: dissemination is not simply a

matter of knowledge communication. In conclusion, there are already a number of active models of research dissemination being employed.

Another example is the Ulysses project under the Human Dimensions of Environmental Change part of the Fourth Framework Programme had as its aim 'to bridge the gap between environmental science and democratic policy-making for the issue of climate change' (European Commission DGXII, 1998a).

5.2.3. Current dissemination of environmental research: passive

All of the organisations that were contacted in this study use the web to disseminate research results. They all have their own web-sites and many collaborate in the use of others, as with CORDIS. Although the brief of this report is not to provide a critique of these dissemination methods, they do form a central plank in current dissemination strategies. So the following comments are given as a context within which any action by the Agency will take place.

CORDIS, the Community Research and Development Information Service, is the main mechanism used to disseminate the results of Framework Programme research. This service has several excellent features:

- it contains a huge amount of information that would be hard to provide in paper form
- it is possible to download entire databases of information, such as lists of publications, for use locally. This is a useful function that should ideally be extended to other areas
- it provides contact information on where to find further help on your enquiry.

Although comprehensive, this service has several drawbacks:

- the launch of the Environment and Climate homepage on CORDIS took place in mid 1998. It will take time for awareness of this to grow, and this is more likely to happen if knowledge about the site is actively disseminated
- it seems that results of research programmes are only posted once all the results of the programme are available. This resulted, for example, in the reports of the SEER programme, which ended in 1994, being posted in late 1998
- this is partially rectified by the availability

of information about on-going research on the 'Europa' website. However, this distinction is not obvious to outside users of the service

- it is an entirely passive mechanism, requiring users to come to it via the web. This passive function could usefully be complemented by an active function such as an email news group that would provide updates on information on the website and on the research programme more generally.

- there is confusion in some parts of the site as to which audience is being addressed. For example, the section on 'Realising the full potential of research achievements' (www.cordis.lu/env/src/results.htm) is addressed mainly to researchers despite it being of great potential interest to non-academics.

The CORDIS service is still clearly under development and has much potential. However, the above thoughts provide some indication of how the development of CORDIS might be steered in a direction that focuses more closely on the needs of its key users. As a key user, the Agency might help clarify directions in which improvements could be made and value added by the Agency's involvement.

6. A new role for the European Environment Agency

The European Environment Agency has recently acquired new responsibilities to disseminate environmental research. The revised regulation (1999), article 2(ii) states that the revised tasks of the Agency include:

– 'to provide the community and the Member States with the objective information necessary for framing and implementing sound and effective environmental policies; to that end, in particular to provide the Commission with the information that it needs to be able to carry out successfully its tasks of identifying, preparing and evaluating measures and legislation in the field of the environment'.

The new task to disseminate environmental research results comes under article 2(xiii), where the Agency is asked:

– 'to assist the Commission in the diffusion of information on the results of relevant environmental research and in a form which can best assist policy development'.

The role for the Agency is to provide the link between research and policy. From the research side, this means putting the results of research into a policy context. From the policy side, it means helping to frame the policy context by drawing on authoritative research-based insights into effective ways of moving towards sustainability. This is a huge dual challenge in conceptual, intellectual and organisational terms.

Many of those interviewed could see a useful potential role for the Agency in occupying a space that overlaps both the research and the policy worlds. Clearly there is a need for positive collaborations with the other relevant bodies in the Commission and beyond. It will not be helpful if the Agency is seen to be either poaching the responsibilities of others or critical of their approach to research dissemination. One of the fortunate aspects of the development of a strong new interest in the benefits of the dissemination of research is the degree of consensus that exists around the subject. Everyone agrees that more can be done. The question is to work out which parts of the task can most helpfully be done by whom.

However, the Agency could play a unique role as a 'champion' of evidence-based environmental policy. Although the Agency clearly does have constraints, it does not have the *same* constraints as other parts of the Commission. So, for example, by bringing together, clarifying and presenting a range of the best research on new environmental policy instruments, it can help move debates forward that might otherwise get stuck in the more political parts of the European decision-making processes. The Agency has already done useful work of this sort on the issues of environmental taxes, externalities of agriculture, and endocrine disrupting chemicals.

The EEA can play an important part in research dissemination simply by being an intelligent customer and supporter of sustainable development research. As pointed out in the journal *Global Environmental Change* by Liberatore and Sors, two research managers of environmental social science research at DG Research, research on sustainable development is still 'far from mainstream' despite making significant progress in recent years (Liberatore and Sors 1997). Making mainstream demands of the research that does exist – and giving it mainstream profile – can help to move the whole frontier of this vital field forward.

6.1. Dissemination in the face of complexity

The complexity of environmental policy-making provides both the challenges and the opportunities for the Agency in disseminating environmental research (Waterton and Wynne 1998). Given that the Agency has been given the role to help 'frame' European environmental policy, it would seem essential that the Agency retain the ability to step back from the mass of research being undertaken and to try to extract some of the more strategic and generic lessons emerging from the research community. This is for a number of good reasons.

Resources: First, the Agency clearly cannot take upon itself the task of disseminating all of the insights arising from individual pieces of research being undertaken: it simply does not have the resources to do this thoroughly.

Other parts of the Commission are already undertaking much dissemination and are in any case closer to the research process.

Trust and consensus: Second, effective environmental policy-making increasingly relies on trust between the public and private actors involved, and in trying to reach a consensus. This is one of the findings of recent research on voluntary approaches to environmental policy-making (Wageningen University, 1998). Trust can be enhanced by greater openness in the policy-making process, and a clear set of principles that are seen to be guiding the process. Generic research findings and principles of sustainability have an important part to play here.

Uncertainty: As pointed out in a growing body of social science literature, there are deep uncertainties about many aspects of our knowledge of the environment, and also large gaps in our knowledge – 'ignorance'. These uncertainties and gaps in knowledge are not minor distractions: in some cases they are the dominant factors in debates around appropriate environmental policy.

By being able to step back from the mass of environmental research information that *does* exist, the Agency will be able to focus on areas where knowledge *does not* yet exist. In this way, it will be able to help frame policy approaches by pointing to the dangers of basing policy on inadequate knowledge, or of having no policy because of an absence of knowledge. It will also be able to send clear signals as to requirements for new knowledge.

6.2. A systematic approach

This final section brings together many of the findings of this report in the light of the European Environment Agency's new responsibilities in this area. The following key actions are suggested:

- inject the Agency into research networks
- identify the key audiences and their needs
- spot the policy 'opportunities'
- target research to key audiences, including the academic community
- ensure benefits for the research community
- consider a range of dissemination vehicles or brokers
- use each output as a stepping stone to further dissemination
- strike a balance between disseminating 'focused' and 'general' messages.

Within research initiatives such as the Global Environmental Change Programme, the aim of research dissemination has been to promote wide awareness of the results of a limited universe of research projects – a form of 'research push'. By contrast, the European Environment Agency, in undertaking its new research dissemination function, faces a different task. The emphasis will neither be on 'research push', nor on 'policy pull' alone: the focus is on combining the two to promote the implementation of sustainable development.

6.2.1. Connect with the research providers

However, the Agency is not involved in commissioning or managing most of the relevant research, so it will need to *establish or enhance its relationships with European research providers.* The existing formal contacts between the Agency and DG Research are useful in this respect and could be extended to other research providers. The Agency needs to develop systems to ensure that it keeps informed of relevant research initiatives and associated dissemination. If possible, Agency staff need to develop good personal contacts with the key people in the relevant research organisations. Only by injecting itself within research networks will the Agency truly be able to undertake effective research dissemination.

This role could usefully then be extended to feeding back into the research system the needs that the Agency perceives from research. This completes the cycle of communication between researcher and policy-maker and addresses the legitimate criticism that research 'dissemination' is often seen as a linear process. It can also provide the research community with a key benefit from interaction with non-academics.

6.2.2. Identify the key audiences and their needs

The next task is to *identify the needs of key audiences.* Clearly the Agency has done a lot of work already in working with key groups of stakeholders of environmental information. Learning from the Global Environmental Change Programme's use of consultancies in establishing contacts with key audiences, there are strong benefits of doing this work in-house if at all possible. This is because interviews of policy-makers can be useful to generate the personal contacts on which subsequent dissemination work can build. Interviews are useful both for information gathering *and* dissemination of core messages. Doing the work in-house will ensure that lessons and contacts are 'internalised'. If

the decision is made to put the work out to contract, close management is necessary to ensure that full value is captured.

Interviewees acknowledged the Agency's existing networks and thought that it could usefully extend its role in creating clusters and nodes around topics, especially by helping where particular people or organisations are isolated.

6.2.3. Spot the policy opportunities

The Agency then needs to *spot policy 'opportunities'*. Several research providers expressed interest in working with the Agency on this task. These will be the hardest decisions, and this paper will not focus on providing further advice on this at this stage.

6.2.4. Target research to key audiences

Once these opportunities have been spotted, the task will be to *target research to key audiences*. This can be achieved in a number of ways along similar lines to those used by the Agency already – focused and timely meetings on key subjects, and clear synthesis reports that bring together a range of research around a particular topic. The Agency can call on a wide selection of research, and this provides real opportunities for creative intervention. For example, much dissemination focuses on current research at the expense of good research that is slightly older but still relevant. The Agency may be able, where suitable, to access older insights as well as new findings and recreate fresh evidence from existing knowledge. Key audiences include the Environmental Advisory Committees (EEAC) in Member States and accession countries, which directly advise government leaders.

6.2.5. Count researchers as a key audience

The Agency should not forget the academic community as a key audience. In the same way that the Agency has a role to help 'frame' policy developments, by helping to 'frame' research directions by targeting the research community it will be multiplying its effectiveness over the medium term. Given the ambiguous relationship between science and sustainability, there would seem to be a significant role to be played in bringing about 'sustainable science'. By providing clear goals for research, and an increasingly clear conceptual framework for sustainable science, the Agency can help play an important role in infusing sustainability into one of modern society's key sources of knowledge and authority.

6.2.6. Ensure benefits for researchers

The Agency also need to ensure benefits for the research community from being involved in dissemination activities. This should not be too difficult. It partly means ensuring that suitable rewards are attached to this activity: a common finding, confirmed in my interviews, is that researchers are not rewarded proportionately for engaging with non-academic audiences. The Agency can help by requesting that a dissemination component is required in research funding – so that researchers actually receive resources for undertaking dissemination activities.

A further benefit for researchers is one that would be too easy for the Agency to overlook: access to its networks of suitable, interesting non-academic groups with which to interact. Researchers often face a huge task in identifying and connecting with suitable non-academic research users: the Agency can provide quality assured short-cuts.

As hinted at already, providing benefits to researchers also means structuring dissemination activities in ways that give feedback to researchers – dissemination is better to be thought of as communication, implying a more two-way flow of ideas. As Huberman points out 'the negotiation of findings with different audiences, and above all with an interactive component, can have salutary effects on researchers' conceptual frameworks, instruments and interpretations. It can change their minds too. We could conjecture, in fact, that few dissemination efforts of any value would occur unless there were new insights on both sides' (Huberman 1994: 31).

6.2.7. Use each output as a stepping stone to further dissemination

The Agency needs to use its outputs not only as authoritative works in their own right but also as signposts to further material for those readers that wish to explore particular issues in more detail. For example, the Dobris report was mentioned spontaneously by several respondents, but could have been more useful if it had contained better references to more in-depth material. The Agency should produce materials that do not pretend to be the 'end of the line', but a key link in a long chain of relevant and useful information.

6.2.8. Balance focused and general messages

Finally, it is desirable to strike a balance between disseminating 'focused' and 'general' messages. One reason is that specific,

focused dissemination is enhanced by having a broader base on which to sit. For example, it is useful to have general supporting information materials and a website.

But perhaps more importantly, broad dissemination has a central role to play in supporting general policy development. As has already been noted, policy is no longer developed by a small group of 'policy-makers' but needs to be legitimised by a large group of institutions with widely different sets of interests. Research dissemination needs to hit this large group of interests if it is ultimately to be effective. The effects of broad dissemination are certainly more difficult to measure, but this does not mean that it is any less important an activity.

And we should not forget one of the key reasons for undertaking research dissemination – that research is seen as such a special source of authority in society. The very fact that environmental research is being conducted on such a large scale is itself a message that can help to reinforce the importance of environmental issues in the minds of these audiences.

7. Conclusions

This report has been an attempt to bring together a range of ideas about an important area: how to put to research to use in the pursuit of sustainable development. This is an inherently complex and controversial task, and one about which we are only just beginning to learn. The report is therefore offered with a degree of humility that matches the size of the challenge. Accordingly, comments on this report are welcomed.

8. References

Barker, K. (1994) *Strengthening the impact of R&D evaluation on policy making: methodological and organisational considerations* in Science and Public Policy, vol. 21, 6 pp. 405-413.

Barker, K. and Georghiou, L. (1992) *Evaluation of the economic and social impacts of publicly funded research and development,* in Cannavo, L. (ed) Handbook of Methods in Research Evaluation (Euroma, Rome).

Brown, G.E. (1992) *Report of the Task Force on the Health of Research,* Chairman's report to the Committee on Science, Space and Technology, US House of Representatives, No 56-819, (Us Government Printing Office, Washington).

Caplan, N., et al. (1975) *The use of social science knowledge in policy decisions at the national level.* Ann Arbor, MI: The Institute for Social Research.

Carnegie, (1992) *Enabling the Future: Linking Science and Technology to Societal Goals,* Carnegie Commission on Science, Technology and Government, (New York).

Clark, William C., ed. and the Global Environmental Assessment Project Faculty and Fellows. (1999) *Designing Effective Assessments of Global Environmental Issues: Towards a conceptual framework for learning from experience.* Prepared for the Workshop on *Designing Effective Assessments of Global Environmental Issues: What Is Being Learned?* May 17-20, 1999. Airlie Center, Warrenton, Virginia

Clark, William C. and Giandomenico Majone. (1985) *The Critical Appraisal of Scientific Inquiries with Policy Implications.* Science, Technology, and Human Values Vol. 10, No. 3, pp. 6-19.

Cordis Focus 118, (1998, September), *EU Framework Programmes – Joint Actions Environment. The EU's environmental RTD Programmes – the state of the art.*

Cozzens, S.E., Healey, P., Rip, A. and Ziman, J. (eds.) (1990) *The Research System in Transition,* Dordrecht, Kluwer Academic Publishers.

Dunn, W.N. (1992) *Making a Transition,* Knowledge and Policy, The International Journal of Knowledge Transfer and Utilization, Vol. 5 No. 1.

European Commission (1994) *The Environment – at the heart of European RTD.* The European Union's environmental research programmes. Luxembourg.

European Commission (1996) *Inventing Tomorrow. Europe's Research at the Service of its People. Preliminary Guidelines for the Fifth Framework Programme.* Luxemburg.

European Commission (1997) *Society, The Endless Frontier: A European Vision of Research and Innovation Policies for the 21st Century.* By Caracostas, P. and Muldur, U., Eur 17655.

European Commission, DG XII (1998a) *Criteria and Methods to Integrate Equity, Efficiency and Effectiveness in EU and Global Climate Policy: Report on a DGXII Workshop.*

European Commission, DGXII (1998b) *EU Climate Policy: Research Support for Kyoto and Beyond. Policy/Research Interface Workshop Series: A Synthesis* prepared by Martin O'Connor, Sylvie Faucheux and Sybille Van den Hove.

European Commission, DGXII (1998c) *Stakeholders' perspectives on climate change policies. Report on a workshop held in Brussels, 27 February 1998.*

European Commission 1999a, DGXII, Science, Research and Development directorate website. *Frequently asked questions.*

European Commission, 1999b, DGXII, Science, Research and Development directorate website. *Review of Society, The Endless Frontier.*

European Commission, undated but probably 1998. *Knowledge-based Europe.* A description of European research policy and outline of the Fifth Framework Programme.

Faulkner, W. (1995) *Performance indicators for the assessment of non-academic impact in the social sciences.* Think piece for the UK Economic and Social Research Council. University of Edinburgh, Science Studies Unit.

Funtowicz S., Ravetz, J. and O'Connor, M. (1998) *Challenges in the use of science for sustainable development.* Int. J. Sustainable Development, Vol. 1, No. 1, pp.99-107.

Gibbons, M., C. Limoges, H. Nowotny, S. Schwartzman, P. Scott, and M. Trow (1994), *The New Production of Knowledge*, Sage, London.

Global Environmental Assessment Project (GEA). (1997) *A Critical Evaluation of Global Environmental Assessments: The Climate Experience.* Calverton, MD: CARE.

Global Environmental Change Programme (1999) *Designing 'interactive environmental research for wider social relevance*, Special Briefing no. 4, University of Sussex, May, also at www.gecko.ac.uk.

Global Environmental Change Programme (1999) *The Politics of GM Food: Risk, science and public trust*, Special Briefing no. 5, University of Sussex, October, also at http://www.gecko.ac.uk

HMSO (1993). *Realising Our Potential. A Strategy for Science, Engineering and Technology.* CM 2250. UK Government White Paper.

Huberman, M. (1994) *Research Utilization: The State of the Art' Knowledge and Policy*, The International Journal of Knowledge Transfer and Utilization, Vol. 7 No. 4.

Kostoff, R.N. (1997) *The Handbook of Research Impact Assessment* US Office of Naval Research and at www.dtic.mil/dtic/kostoff/index.html

Kuhn T.S. (1970) *The Structure of Scientific Revolutions*, University of Chicago Press.

Huberman, M. and Ben-Peretz, M. (1994/95) *Disseminating and Using Research Knowledge*, Knowledge and Policy, The International Journal of Knowledge Transfer and Utilization, Vol 7 No.4

Liberatore, A. and Sors, A. (1997) *Sustainable Futures and Europe: a Research Viewpoint from Brussels.* Global Environmental Change, Vol. 7 No. 2 pp87-91.

Lievrouw, L.A. (1992) *Communication, Representation, and Scientific Knowledge: A Conceptual Framework and Case Study* Knowledge and Policy, The International Journal of Knowledge Transfer and Utilization, Vol 5 No.1

Lindblom C.E. and Cohen, D. (1979) *Usable Knowledge.* New Haven, CT: Yale University Press.

Mansfield E. et al. (1977) *Social and private rates of return from industrial innovations*, Quarterly Journal of Economics, 91, pp.221-240.

Mansfield, E. (1991) *Academic Research and Industrial Innovation*, Research Policy, 12.

Martin, B., Salter, A., Pavitt, K., Senker, J., Sharp, M, von Tunzelmann, N. (1996) *The Relationship Between Publicly Funded Basic Research and Economic Performance, A SPRU Review*, Report prepared for HM Treasury.

Mervis, J. (1996) *Agencies scramble to measure public impact of research*, Science Vol. 273, pp.27-28, 5 July.

Office of Technology Assessment (1986*), Research Funding as Investment: Can We Measure the Returns?* Washington DC, OTA.

Rip, A. and van der Meulen, B.J.R (1995) *Non-academic impact in the social sciences: a thinkpiece*, (for ESRC) University of Twente, August

Ruivo, B. (1994) *'Phases' or 'paradigms' of science policy? in Science and Public Policy 21, 3*, pp. 157-164.

Rule, J. (1971) *The problem with social problems.* Politics and Society, Vol 2 No. 1 pp47-56.

Salter, A. D'Este-Cuckiermann, P. Geuna, A. Scott A. Martin, B. (2000) *The impact of publicly funded basic research on innovation*, report to the Committee of Vice Chancellors and Principals and the Higher Education Funding Council for England, SPRU, University of Sussex, May.

Smith, Joe, ed. (2000) *The Daily Globe: Environmental change, the public, and the media.* Earthscan, London.

Wageningen University (1998) *The Voluntary Approach: European experiences in Joint Environmental Policy-Making* by Ingram V., Liefferink, D and Mol, A.

Waterton, C. and Wynne, B. (1998) *Knowledge and political order in the eye of the hurricane: the European Environment Agency, paper for the workshop States of Knowledge: Science, Power and Political Culture*, Harvard University, November 1998: Lancaster University, Centre for the Study of Environmental Change.

Webber D.J. (1991/2) *The Distribution and Use of Policy Knowledge in the Policy Process,* Knowledge and Policy, The International Journal of Knowledge Transfer and Utilization Journal, Vol. 4 No. 4.

Weiss, C. (1981) *Knowledge creep and decision accretion.* Knowledge, Vol. 1 No. 3, pp381-404.

Weiss, J. and Weiss, C.(1981). *Social scientists and decision-makers look at the usefulness of mental health research.* American Psychologist, 36, 837-847.

White, S. et al (1993) *Hitting the Headlines: A practical guide to the media,* The British Psychological Society, Leicester

Ziman, J. (1994) *Prometheus Bound: Science in a dynamic steady state,* Cambridge University Press.